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STONE TOOL ASSEMBLAGES FROM ARNHEM LAND

INTRODUCTION

During the Czechoslovak Expedition to Arnhem Land in 1969 J. Jelínek collected extensive stone tool assemblages from various localities, both by surface collection and occasionally also by excavation. He selected several such assemblages, typologically various, for publication, and requested me to work on them. The collections are Wilton River VII, II, IIa, XXII, Goomadeer (surface and layers 1, 2, 3, 4), and El Sherano on the South Aligator River (Jelínek 1979).

I faced the difficult task of carrying out a typological analysis and evaluate stone tools coming from an environment totally unknown to me and containing some elements dissimilar to the European Palaeolithic assemblages with which I am familiar. Australian archaeologists use for their classification their own rools, which are different from the European Palaeolithic stone tool typology and technology. In addition to this the already very comprehensive Australian specialized literature is represented only by a sample selection in the resources available to me, and I was substantially dependent on information from this quarter.

I was therefore forced to choose a method of analysis for the material which would allow me to start from my experience of European Palaeolithic typology, best represented today by the definitions of types of Mme D. de Sonneville-Bordes and J. Perrot for the Upper Palaeolithic Age. Nonetheless, it was obviously essential to respect the specificities of the Australian industries, which turned out to be more complicated than had at first appeared. The lucid typological works of T. D. Campbell and H. V. V. Noone (1943), S. R. Mitchell (1949), and F. D. McCarthy (1967) were my basic aids. I tried to compensate for the shortage of literature by written consultation with Australian researchers and here I have the opportunity to voice my thanks to Dr. A. Gallus (Nunawading, Victoria) for an overall review of the problem of the Australian stone industries and for information on several specific questions to Prof. J. D. Mulvaney (Canberra), Mrs. J. Flood (Canberra), Prof. J. W. S. Megaw (Sydney, now Leicester, England), Mrs. Dr. C. White-Steiger (Montreal, Canada) and Ph. Allsworth-Jones (Cambridge, England, now Ibadan, Nigeria).

My approach was to choose in the first place from the collections in question the one which seemed most numerous and typologically most diversified — Wilton River VII. I classified this material into groups of types and then into individual types according to European typological and morphological criteria. It was clear from the start that it was possible to classify almost all items by this method, since only a very small number of them were not comparable with the normal forms of the European Palaeolithic age. Points were the dominant group, and indications of the degree to which they had been worked were used in their detailed division in preference to purely morphological criteria (basic geometric shape, longitudinal and transversal section). Using this experience, the remaining collections were then analysed in the same way, except the macroindustries from Wilton River XXII, II and IIa. By combining all the types thus determined, a list containing eleven groups and

more than sixty individual types was obtained. Morphometrical analysis could be carried out only for Wilton River XXII.

Only then an attempt was made to distinguish the significant specific Australian forms among these types: Pirri and Kimberley points, Elouera, Tula-adzes, Leilira blades. It turned out that both types of point can be relatively simply identified, but that the other types of tools are particularly difficult to characterize, especially with certain basic descriptive publications being unavailable. It seems to me that the morphological-technological definitions of these types are too broad, even though they are the only guide to the classification of archaeological finds, where there is a lack documentary evidence on the hafting of stone tools and their function. Australian specialists are here in the happy position that even in the archaeological material there occur hafted stone tools, or at least the remains of resin, and they can deduce the function according to ethnological analogies with the present-day aborigines. This alone made it possible to form the morphological line of Tula-adzes in various stages of wear (Cooper, 1954, 93) and to distinguish their residual forms, so-called burin slug (McCarthy, 1967, fig. 11/6—10), which was impossible through a study of the archaeological material alone. This very circumstance, however, makes possible and even requires the formation of such a precise definition of type as could be used for making a reliable classification without knowledge of recent aboriginal tools and weapons.

DESCRIPTION

In the following description is was decided to use the list of types which was made without regard to locality, while as far as possible applying the basic definitions of stone tool types of the European Palaeolithic according to F. Bordes (1961), D. de Sonneville-Bordes, and J. Perrot (1954—1956) and J. de Heinzelin (1960). Specific Australian tools were then inserted into the system, with a mention of some problems of their classification. A representative selection of all types from the Wilton River (WR) locality VII was drawn, and of the remainder only those types or variants which were particularly characteristic of this or that assemblage, or which did not occur in Wilton River VII. Where the bulb of percussion is preserved on the object, its position is indicated in the drawing by a dot.

Macrolithic assemblages from WR XXII, II and IIa stand in complete isolation, almost without analogy. Individual types are distinguished on a morphotechnological basis and I offer them for further judgement. All types are shown in the drawings and photographs.

On the technology of the manufacture of stone objects, which has already been dealt with for Australian finds by F. D. McCarthy (1967, 13 ff., fig. 2) it is possible to point out that in all the collections under consideration there is a total lack of cores. Those cases where they are given in the summary (esp. in WR IIa) are mostly concerned with small, atypical, probably residual forms of discoid or polyhedric cores. In one or two cases the remains of blade cores with one or two striking platforms were discovered. The corresponding part of the striking platform (talon) on blades and flakes and the inner angle (cf. McCarthy l.c., fig. 2 left) are as a rule obtuse, more rarely a right-angle. In rare cases, however, there also occur typically faceted talons *(Pl. IV/12)* or dihedral *(Pl. VI/4)* also pointed with only slight traces of the striking platform or with none at all. As the criterion for distinguishing blades and flakes the ratio of length and width measured on the axis of formation was taken (the axis running across the bulb of percussion at rigth-angles to the striking platform). A blade is as a rule symmetrical to this axis, its edges are more or less parallel, and its length cannot be smaller than two widths ($l \geqq 2w$).

1. Points: blades or pointed flakes, either completely untrimmed or partly trimmed, either only marginally or uni- or bifacially, flat. They are as a rule symetrical to the axis of formation, they have straight edges or convex ones and the angle of the point should not exceed 45° (according to some authors 60°).

1.1. Untrimmed points. Pointed blades or flakes, whose lengthwise convergent sides are not trimmed. They occur in smaller numbers in all localities and are very polymorphic. Blade points are as a rule symmetrical *(Pl. I/1)*, flake points are very often asymmetrical *(Pl. VII/1)*; their purpose may, however, be indicated by intentional working of their proximal part *(Pl. I/2)*.

1.2. Distally unilaterally trimmed points. Blades or flakes on which the distal part of one edge is trimmed *(Pl. I/4)*. This edge is very often dihedral *(Pl. I/3, 5, 6)*. These points occur in several forms in the localities WR II, IIa and VII.

1.3. Unilaterally trimmed points. Blades or flakes, of which one side is trimmed parallelly along the whole of its length; besides symmetrical points *(Pl. I/7, 8)* there are also asymmetrical ones *(Pl. I/9)*. They are again represented in greater variety in collections WR II, IIa, VII and Gs.

1.4. Bilaterally trimmed points. Blades or flakes, both sides of which are as a rule trimmed parallelly along the whole length.

1.4.1. Symmetrical *(Pl. I/12)* or slightly asymmetrical *(Pl. I/10)*, points of various shapes, usually small in dimensions, trimmed only dorsally.

1.4.2. Symmetrical blade points, usually large and in leaf shapes, heavilly and steeply trimmed bilaterally along the whole length *(Pl. VII/9, 11, 12)*. Found only in ES.

1.4.3. Blades or flakes bilaterally trimmed alternately (one edge dorsally, the other ventrally) *(Pl. I/16, 18)*.

1.4.4. Usually slightly asymmetrical flakes, bilaterally sheerly trimmed in the distal region, with thick top *(Pl. IV/11, 12)*. Found only in WR II. Similar shapes are known as "bec" in the European Paleolithic, and belong not to the group "points" but to "awls".

Measurements of the Wilton River XXII assemblage TABLE I.

No.	Type	L cm	B cm	T cm	L/B	L/B average	B/T	B/T average	L/T average
1	Naturally rock lumps	31.–	27.–	11.3					
	5 pieces	23.3	14.6	10.1					
		21.8	15.2	8.–					
		16.2	13.5	6.8					
		15.7	13.5	7.5					
2	Unworked flakes	18.–	18.8	6.6					
	8 pieces	18.8	21.8	8.2					
		9.8	15.6	5.2					
		15.6	12.4	4.6					
		11.2	10.6	5.–					
		15.–	8.8	4.7					
		7.6	9.–	1.9					
		6.3	5.8	2.1					
3	Side-scrapers	9.8	9.7	3.8	1.01		2.55		
	4 pieces	8.2	7.5	3.6	1.09		2.08		
	7 fragments	9.–	7.8	3.7	1.15		2.11		
		9.5	7.1	2.2	1.34	1.14	3.23	2.41	2.74
4	Rectangular flakes	18.8	10.1	5.4	1.86		1.87		
	2 pieces	21.–	9.8	5.3	2.14	2.–	1.85	1.86	3.72
5	Heavy flakes	18.8	12.2	4.5	1.95		1.72		
	4 pieces	11.4	7.1	3.9	1.60		2.23		
		20.–	12.5	5.6	1.54		2.71		
		19.5	10.–	5.8	1.61	1.68	1.82	2.18	3.52
6	Thick flakes	22.1	14.9	6.8	1.48		2.19		
	5 pieces	18.–	9.2	5.5	1.96		1.67		
	1 fragment	20.9	12.5	5.8	1.67		2.16		
		19.4	12.8	5.8	1.52		2.21		
		27.–	12.5	5.2	2.16	1.34	2.41	2.45	3.29
7	Partly bifacially worked	14.3	9.5	3.8	1.50		2.50		
	13 pieces	14.5	8.–	4.8	1.81		1.67		
	1 fragment	14.4	8.7	4.2	1.65		2.07		
		13.8	7.7	3.8	1.79		2.03		
		13.4	9.–	3.8	1.49		2.37		
		12.2	8.4	3.8	1.45		2.21		
		11.8	7.7	3.8	1.53		2.03		
		11.5	8.7	3.8	1.32		2.29		
		11.5	8.3	3.5	1.38		2.37		
		10.8	7.7	3.5	1.44		2.14		
		10.5	6.–	4.1	1.75		1.46		
		8.5	6.9	3.3	1.23		2.09		
		8.8	7.1	2.5	1.24	1.51	2.84	2.13	3.20
8	Bifacially worked	17.–	9.2	5.8	1.85		1.59		
	9 pieces	15.5	9.9	5.3	1.56		1.87		
		13.5	8.5	4.8	1.59		1.77		
		13.8	8.1	4.6	1.70		1.76		
		12.–	9.1	5.1	1.33		1.78		
		11.8	8.–	3.5	1.48		2.28		
		10.8	9.3	5.1	1.15		1.82		
		10.–	7.–	3.1	1.43		2.26		
		13.6	9.4	4.8	1.45	1.52	1.96	1.84	2.80
9	Hand-axe	10.8	7.5	5.–	1.44	1.44	1.5	1.5	2.16
10	Cleavers	16.7	12.–	7.1	1.39		1.69		
	3 pieces	12.2	6.8	3.5	1.79		1.96		
		15.8	9.9	6.1	1.60	1.56	1.62	1.72	2.68
11	Chopping-tools	11.6	14.2	6.–	0.82		2.37		
	2 pieces	10.6	16.6	5.8	0.64	0.72	2.86	2.61	1.61
12	Horse hoofs	14.–	11.2	7.8	1.25		1.64		
	2 pieces	14.2	11.2	7.5	1.27	1.26	1.49	1.46	1.84
13	Horse-hoof notched	12.3	8.7	7.–	1.41	1.41	1.24	1.24	1.76
	+ 1 fragment								
14	Discoid flake	11.3	12.6	5.5	0.90	0.90	2.29	2.29	2.05
15	Discoid cores	11.6	8.2	4.–	1.41		2.05		
	7 pieces	11.3	9.–	4.6	1.26		1.96		
		10.4	7.8	3.7	1.33		2.11		
		11.–	8.6	5.2	1.28		1.65		
		9.9	8.6	4.2	1.15		2.05		
		9.6	8.6	3.9	1.12		2.21		
		11.–	8.9	4.3	1.23	1.25	2.07	2.–	1.50
16	Discoid flat core	8.8	8.2	3.–	1.07	1.07	2.73	2.73	2.93
17	Irregular cores	10.4	7.2	8.3					
	2 pieces	6.7	6.5	5.–					
18	Unfinished artefacts	23.–	11.3	6.1	2.04		1.85		
	5 bifacially	18.–	7.8	4.2	1.31		1.86		
	5 indistincts	16.2	9.2	4.2	1.76		2.19		
		15.–	10.8	5.1	1.39		2.12		
		11.7	7.5	4.5	1.56		1.67		
	1 unifacially	17.3	13.4	5.8	1.29	1.58	2.31	2.16	3.42
19	Irregular unifacially	12.–	8.–	3.3	1.50		2.42		
	worked	11.4	8.7	3.5	1.31		2.49		
	5 pieces	11.8	10.6	4.7	1.11		2.26		
	1 fragment	11.1	7.3	4.7	1.52		1.55		
		13.5	10.7	5.3	1.26	1.32	2.02	2.11	2.78
	Total: 93 pieces								

Indices of types groups TABLE II.

	WR II	WR IIa	WR VII	G s	G 1	G 2	G 3	G 4	E S
Trimmed points (1.2—6)	46.65	47.03	61.86	32.44	3.85	40.58	36.23	41.38	10.58
Points total (1)	52.44	49.73	64.43	40.89	11.54	40.59	36.23	50.—	13.76
End scrapers (2)	5.18	10.27	2.83	2.22	—	—	1.45	—	7.05
Truncated implements (3)	3.66	4.86	3.35	—	—	—	—	—	23.99
Side scrapers (4)	5.49	9.73	10.82	11.11	23.08	26.09	11.59	12.07	10.58
Burins (5)	1.52	3.24	1.29	2.22	7.69	2.90	1.45	3.45	9.52
Fabricators (6.1—3)	0.30	1.08	0.78	6.67	11.54	14.50	5.80	5.17	4.23
Elouera (7)	0.91	2.70	—	—	—	—	—	—	0.17
Backed implements (8)	—	0.54	—	7.56	19.23	10.14	13.04	10.34	0.70
Trimmed blades (9.3 + 10.1 — 3)	11.89	1.62	—	15.11	—	—	—	—	17.01

1.5. Blades or flakes, flattened only unifacially, usually asymmetrical.

1.5.1. Points worked only dorsally, either completely *(Pl. I/11, 15)* or with remnants of unworked surface still remaining *(Pl. I/13, 14)*. The distal part is often ridged.

1.5.2. Points worked only ventrally *(Pl. I/17)*, occurring occasionally in all collections.

1.6. Blades or flakes worked bifacially; the bulb of percussion has usually been removed.

1.6.1. Points worked bifacially, only partly, so that the major part of one side remains untrimmed; usually planoconvex in cross-section. In most cases the dorsal side is completely worked, while the ventral one only on the edges *(Pl. II/1)*, on the edges and on the base *(Pl. II/2, 4)*, or partly planally *(Pl. II/3)*. More rarely the ventral side is completely worked and the dorsal one only partly *(Pl. II/5)*.

1.6.2. Points completely worked bifacially, or with only a small part of one surface remaining untrimmed *(Pl. II/6, 13)*; the cross-section being most often asymmetrically biconvex, occasionally regularly lenticular *(Pl. II/10, 12, III/4)* or planoconvex. The distal part is sometimes ridged *(Pl. II/7, 8)*. The shape of the point is most often that of a leaf with curved base, either narrow *(Pl. III/1—4)* or broad *(Pl. II/9, 11, 14)*, and sometimes has a regular triangular shape with straigth base *(Pl. VI/12)*. In some cases the striking platform is still preserved *(III/3)*.

1.6.3. Large bifacial points, usually thicker in the proximal region *(Pl. III/5)*, of various sizes, which may also approach a shape comparable to European bifaces (hand axes) of the Lower Palaeolithic *(Pl. V/6)*.

1.6.4. Heavily ridged points, having an almost triangular cross-section of the distal part *(Pl. VI/7)* were found only in the Goomadeer locality.

2. End-scrapers. Blades or flakes having the distal edge (in the direction of the axis of formation), i.e. the edge opposite the bulb of percussion, worked in such a way that a convexly curved head is formed, usually symmetrical to the axis of formation. They are worked more or less steep, usually with parallel (lamelar) trimming, often converging in a fan-shape.

2.1.1. Simple end-scrapers on blades *(Pl. VI/15)* or flakes *(Pl. III/6)* whose remaining edges are not trimmed.

2.1.2. End-scrapers whose lengthwise edges are trimmed, occurring in small numbers in WR II and VII, represented more numerously in ES. Trimming may be either unilateral (side and end-scrapers in the Australian terminology) or bilateral (double-sided end-scrapers).

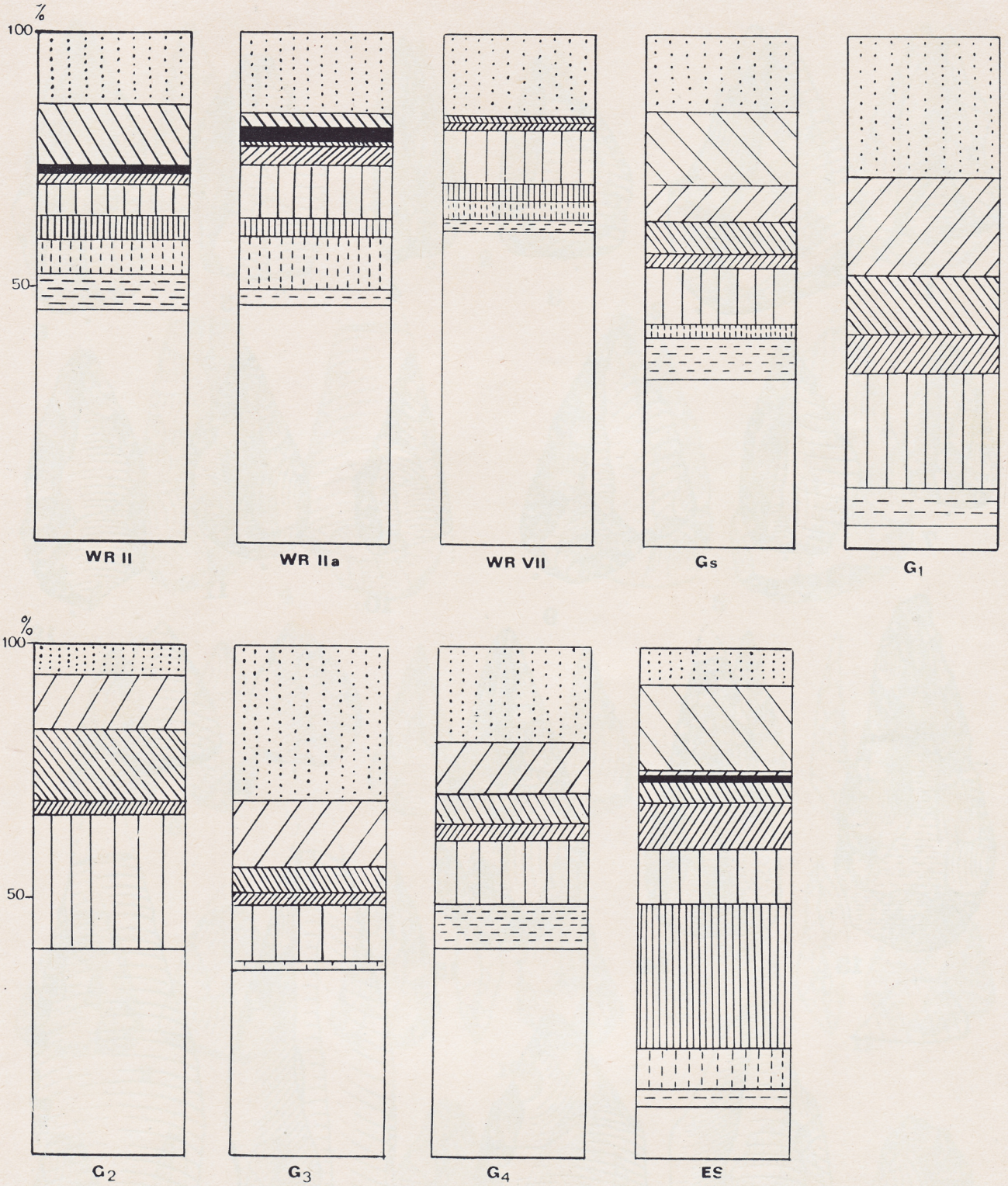
2.1.3. In one instance only a round scraper was found, in locality WR II, trimmed all round.

2.2. End-scrapers whose rounded head is worked in such a way as to form a denticulated edge *(Pl. VII/8)*. They occur in small numbers in collections WR II. Gs, ES. In the European Palaeolithic these objects are classified as an independent type in the group "denticulés": it seems that in the Australian material it would be suitable to leave them in the group scrapers. The tool illustrated, from ES, is interesting in that its whole surface apart from the distal region has weathered edges and the ventral surface is also smooth; only the scraper head has sharp edges. This seems to be a case of the later re-use of an older, wind-smoothed artefact.

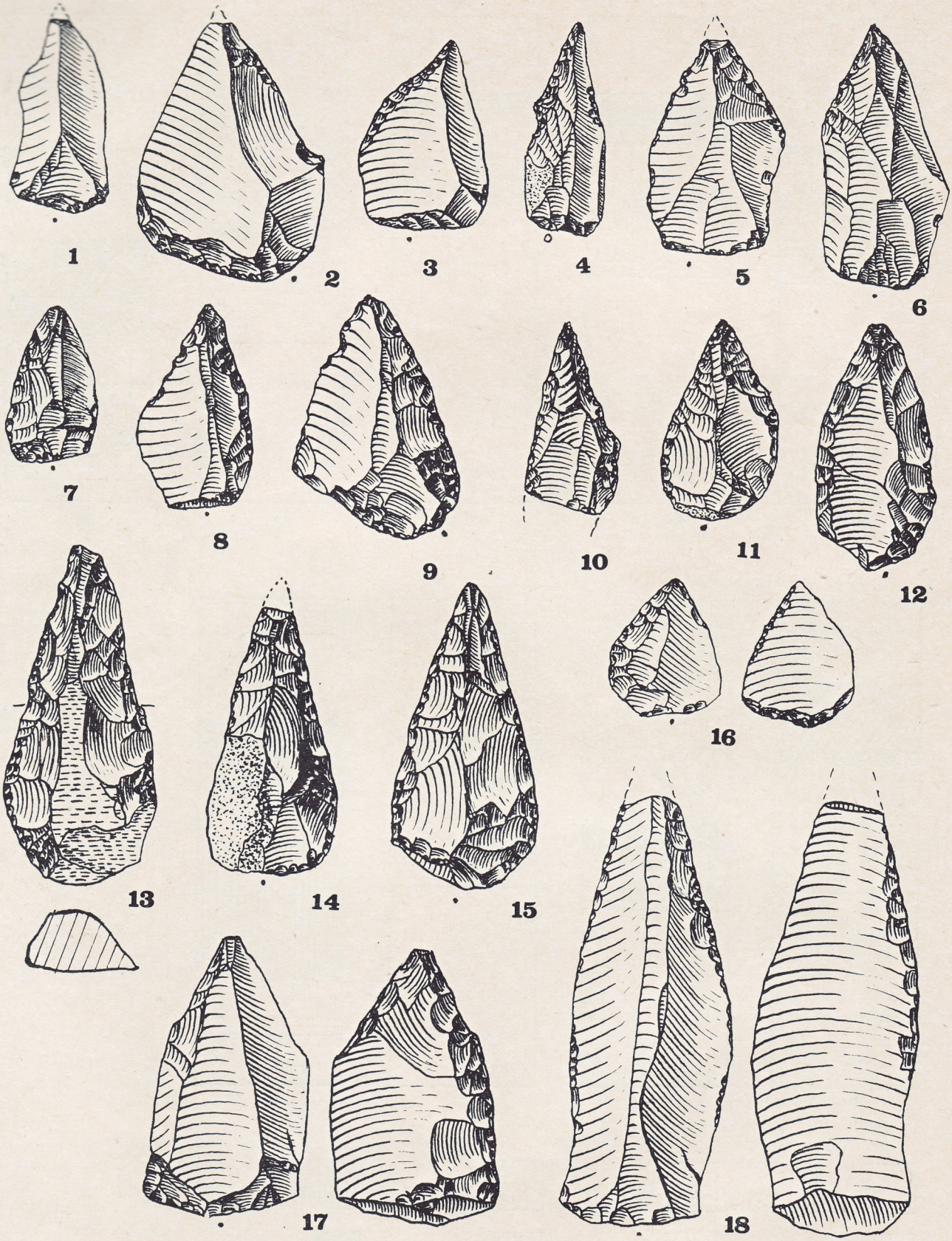
2.3. End-scrapers on large and usually thick flakes, found only in WR IIa, form an independent, though very polymorphic, type. There are among them some with regularly worked heads, completely similar to the keeled scrapers of the European Aurignacian *(Pl. V/5)*. Others are denticulated *(Pl. V/3)*, most have heads slightly convexly shaped, or almost straight, occasionally also slightly concavely shaped *(Pl. V/4)*. This last shape is really already outside the definition of scrapers and belongs to the group of truncated flakes; this illogicality is justified by their exceptional nature and clear typogenetical relation to typical scrapers.

2.4. Core scrapers. Indicates high, often very sheerly worked all around pebbles or rock fragments, whose base is ussually irregularly circular to polygonal *(Pl. III/7)*. Their distinction from mere cores is for the time being not at all easy, and perhaps only trasalogical studies would be able to show whether this is really a tool with a specific function.

3. Truncated implements. Blades or flakes,

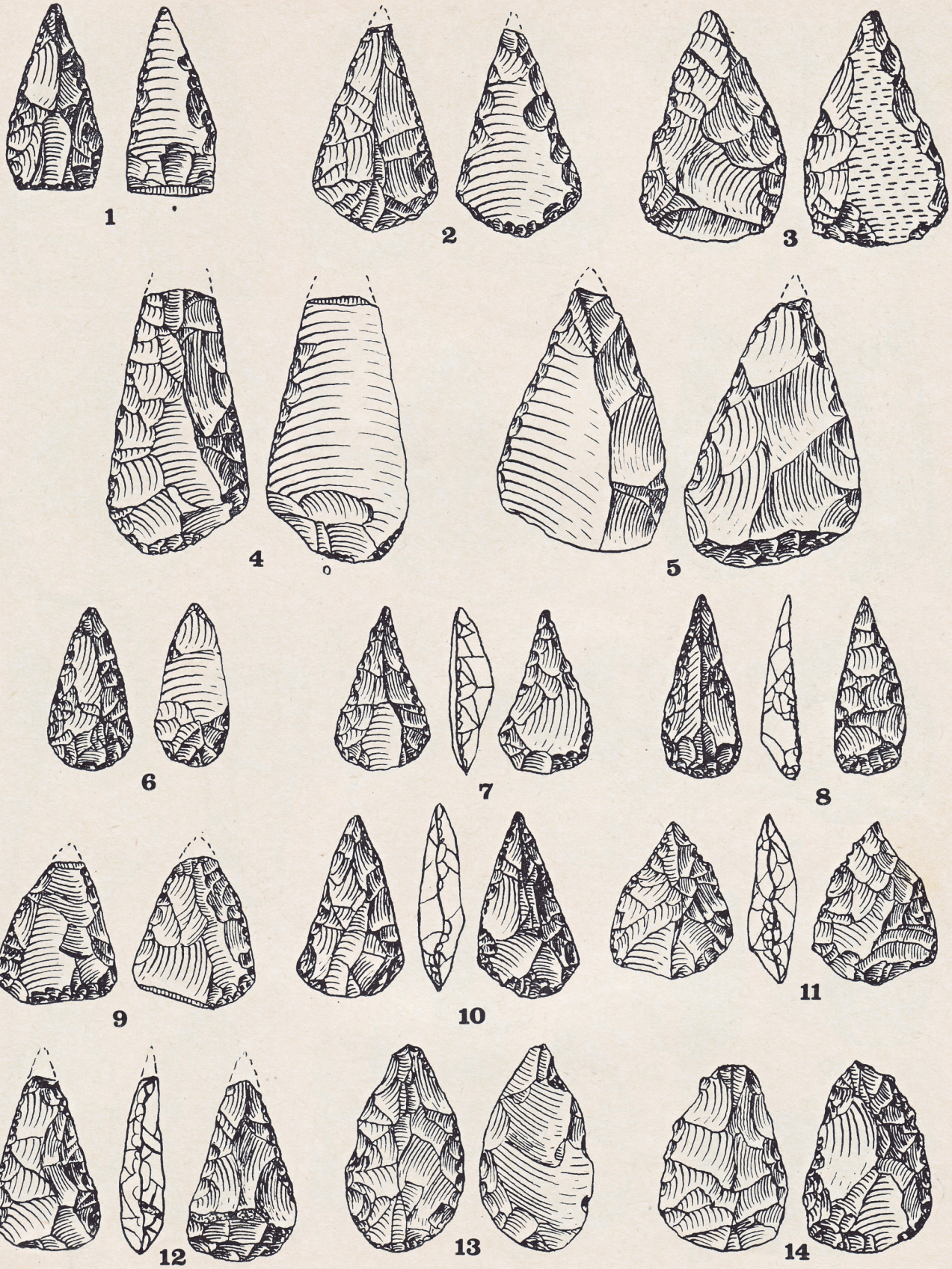


Diagrams of the tool-groups indices



TAB. I.

Wilton River VII. Nat. Size.



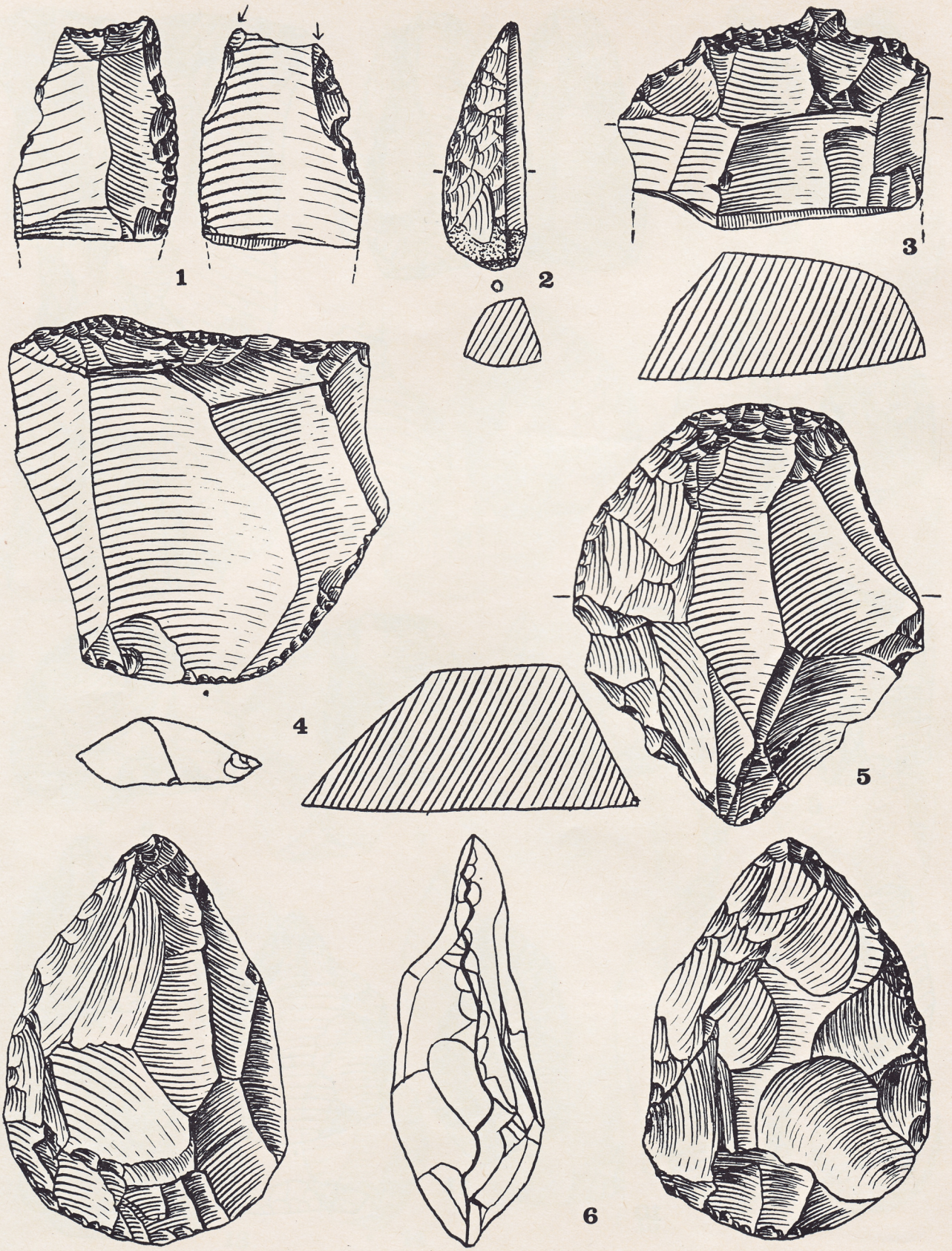
TAB. II.

Wilton River VII. Nat. Size.

TAB. III.

Wilton River VII. Nat. Size.

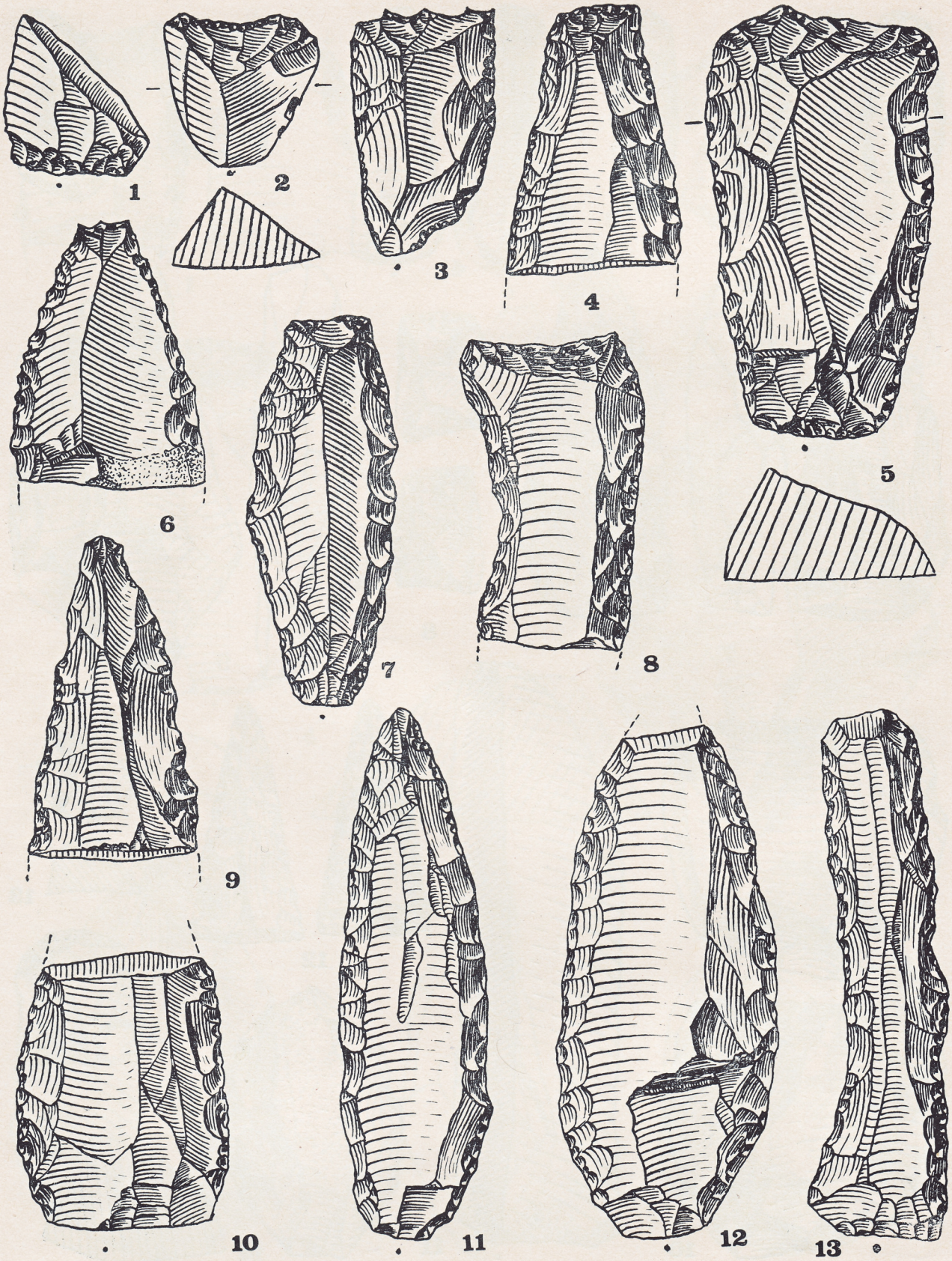
TAB. IV. *Wilton River VII 1—10, Wilton River II 11—13. Nat. Size.*



TAB. V. *Wilton River II 1, 2, 6, Wilton River IIa 3—5. Nat. Size.*

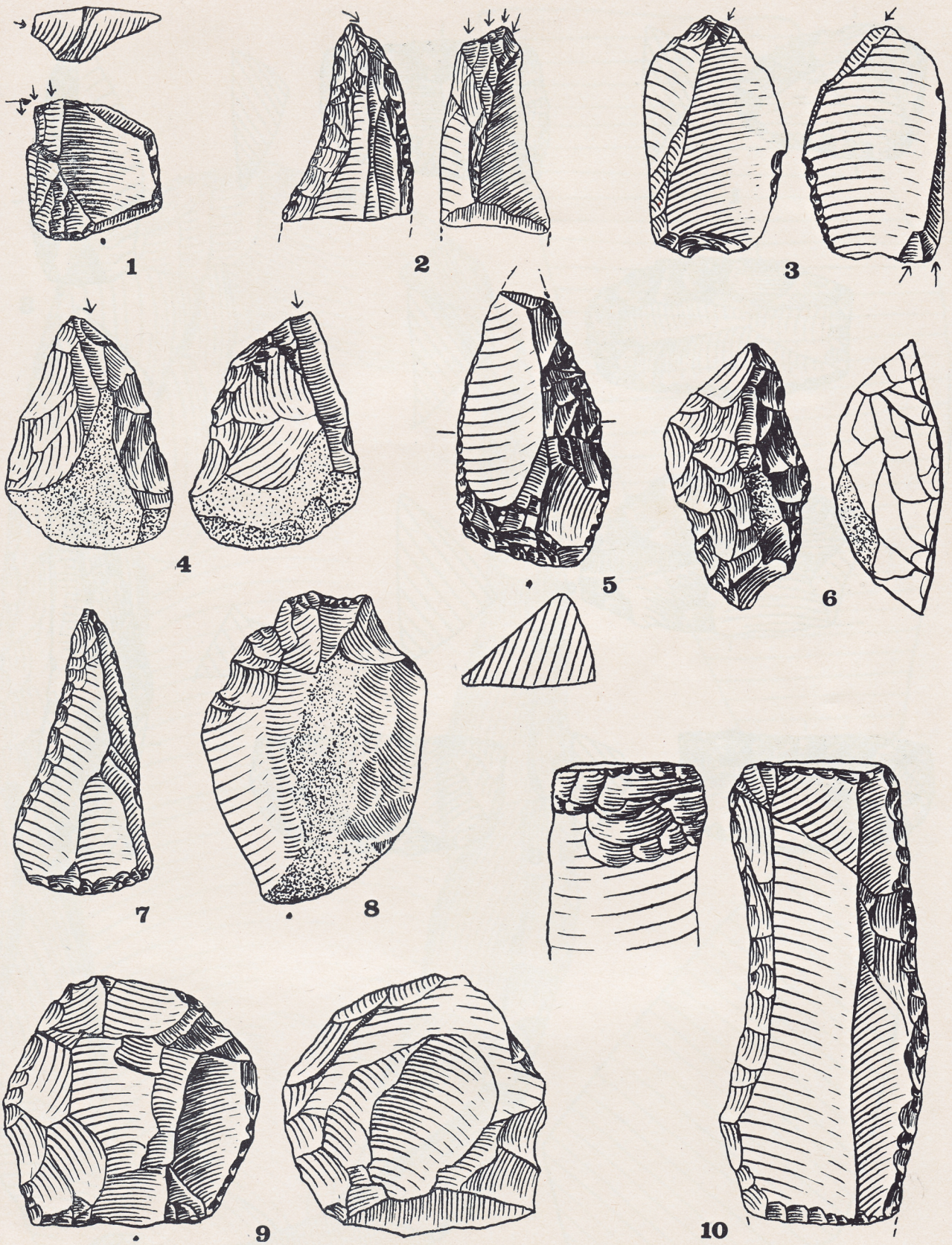
TAB. VI.

Goomadeer. Nat. Size.



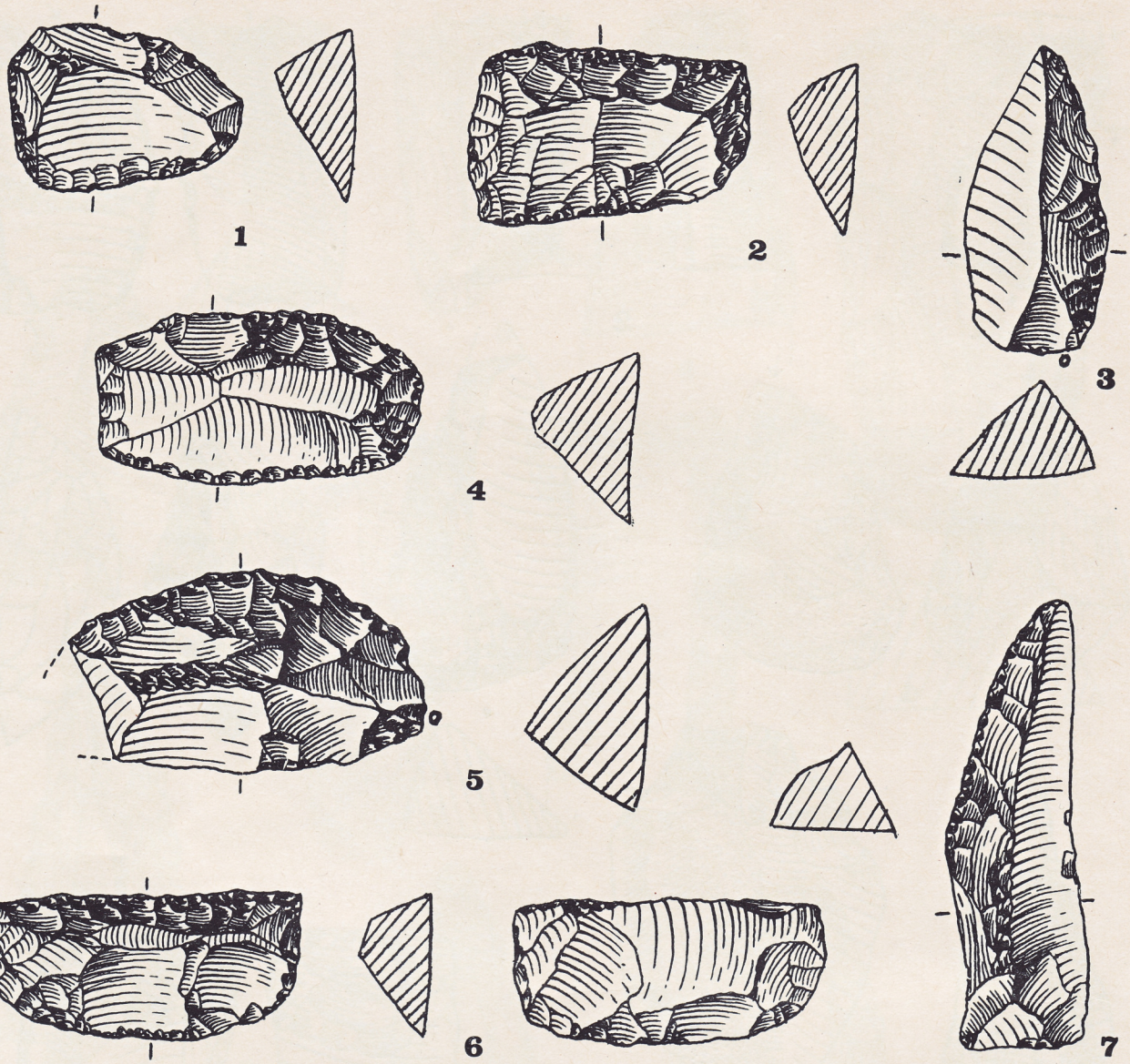
TAB. VII.

El Sherano. Nat. Size.



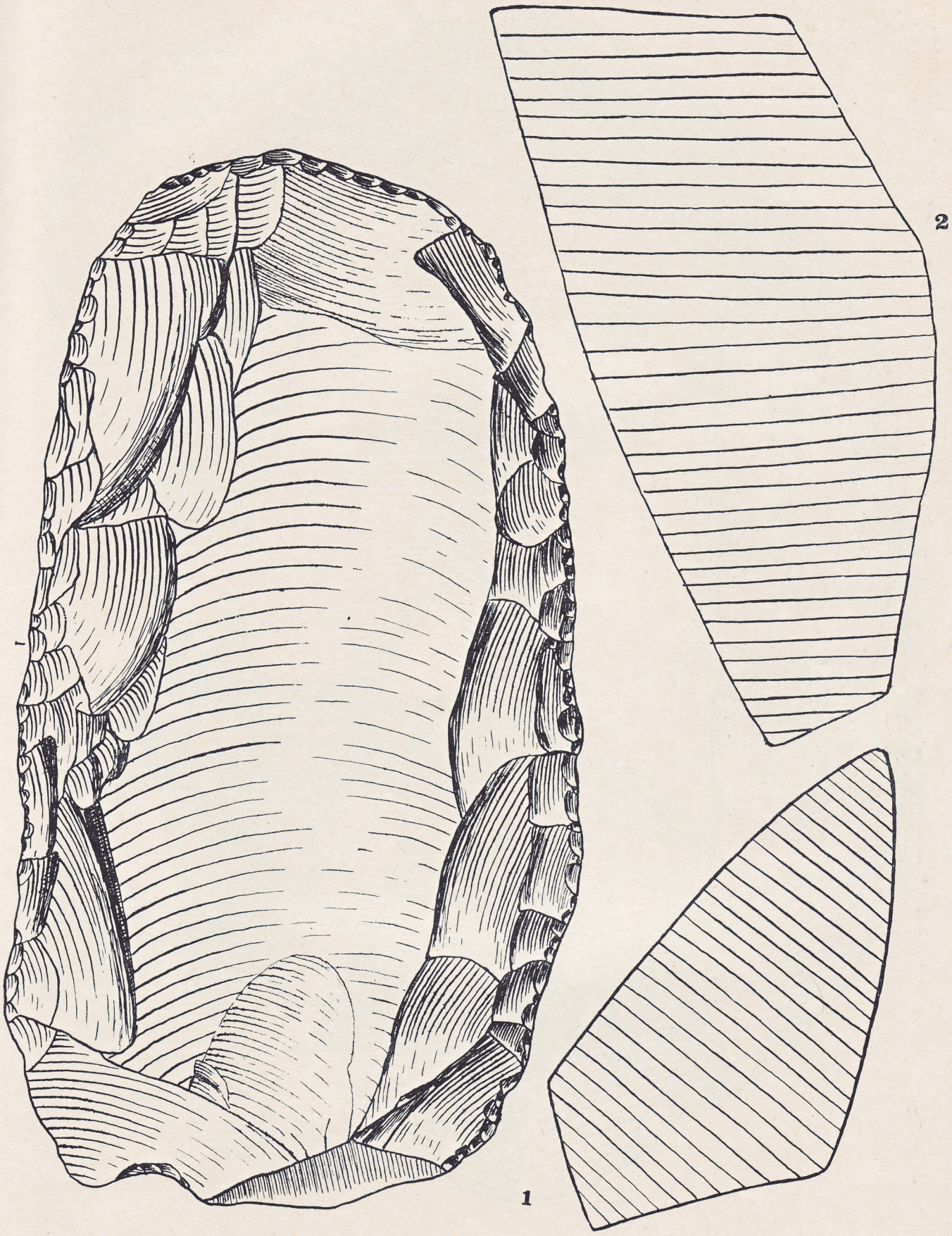
TAB. VIII.

El Sherano. Nat. Size.

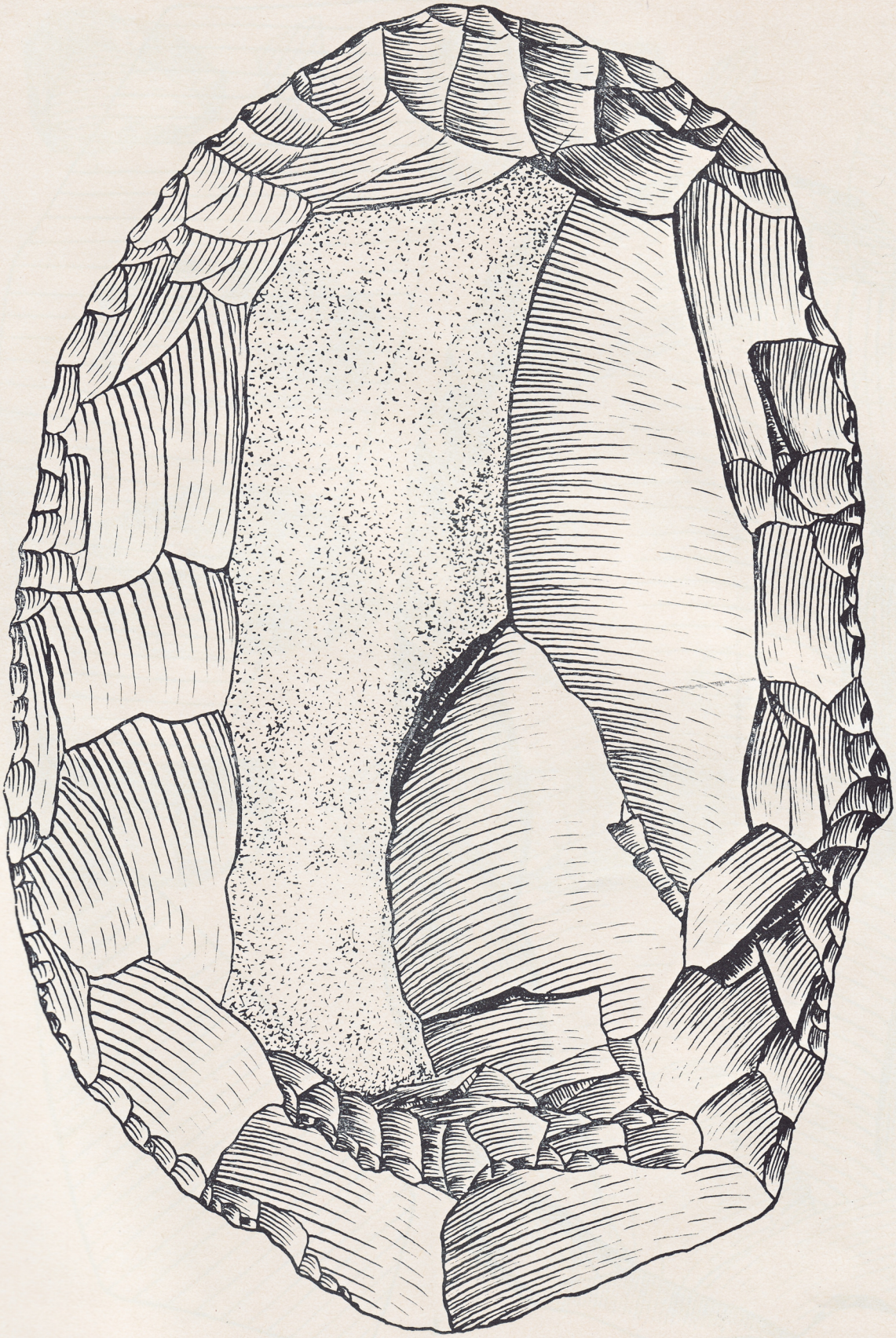


TAB. IX.

Wilton River IIa 1, 2, 4—6, Wilton River II 3, 7. Nat. Size.

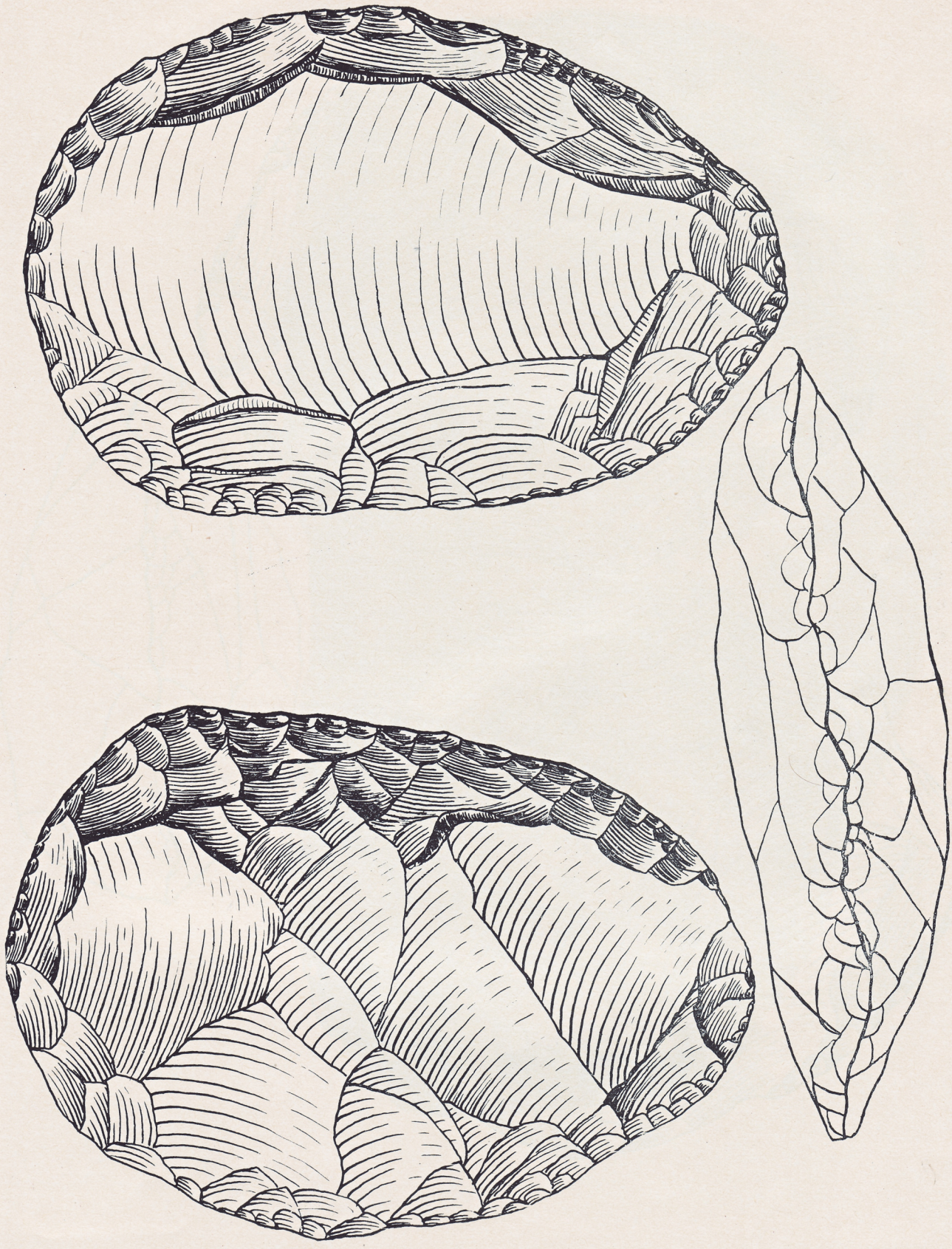


TAB. X.



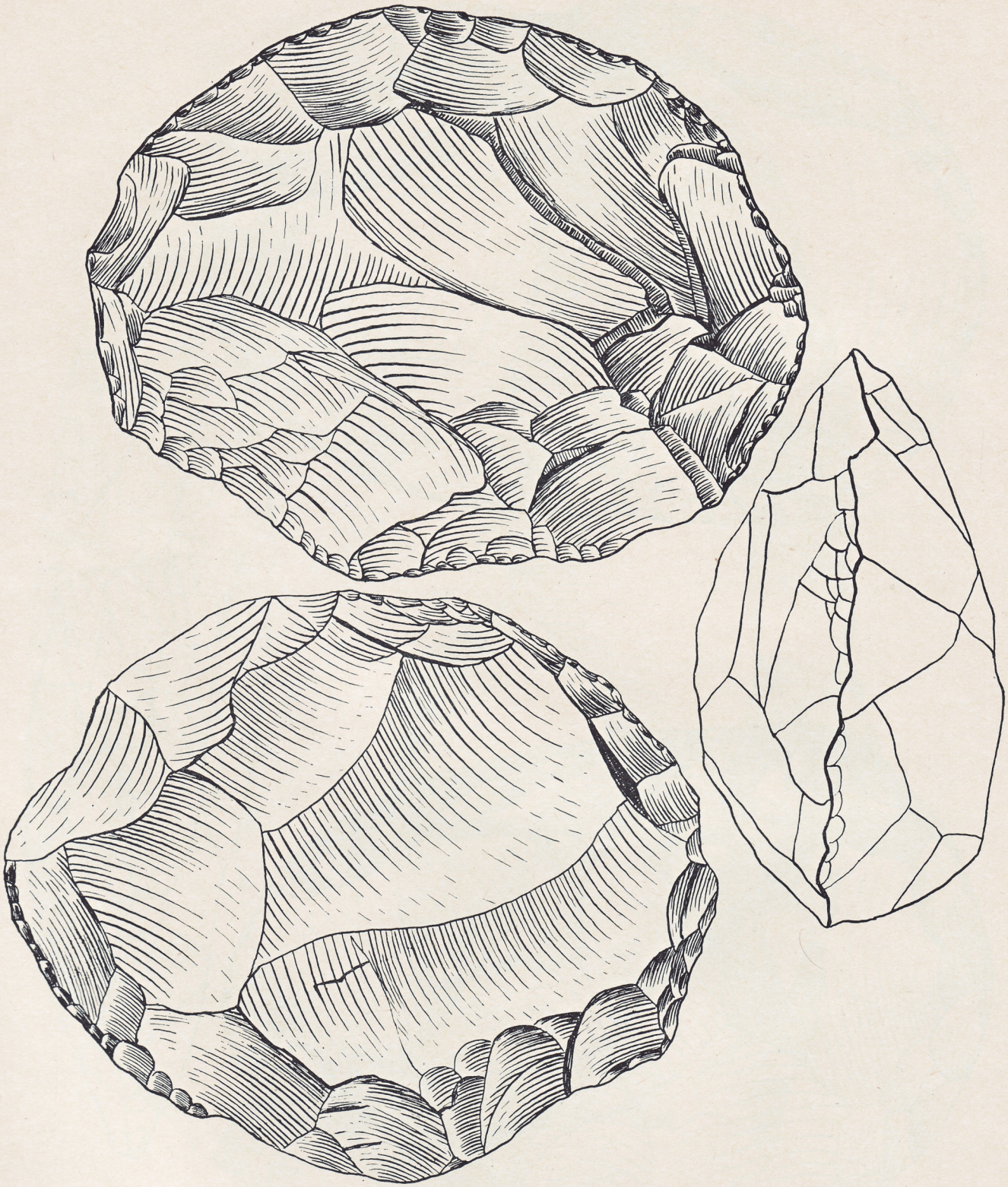
TAB. XI.

Wilton River XXII, fig 2 to tab. XI. Nat. Size.



TAB. XII.

Wilton River XXII. Nat. Size.

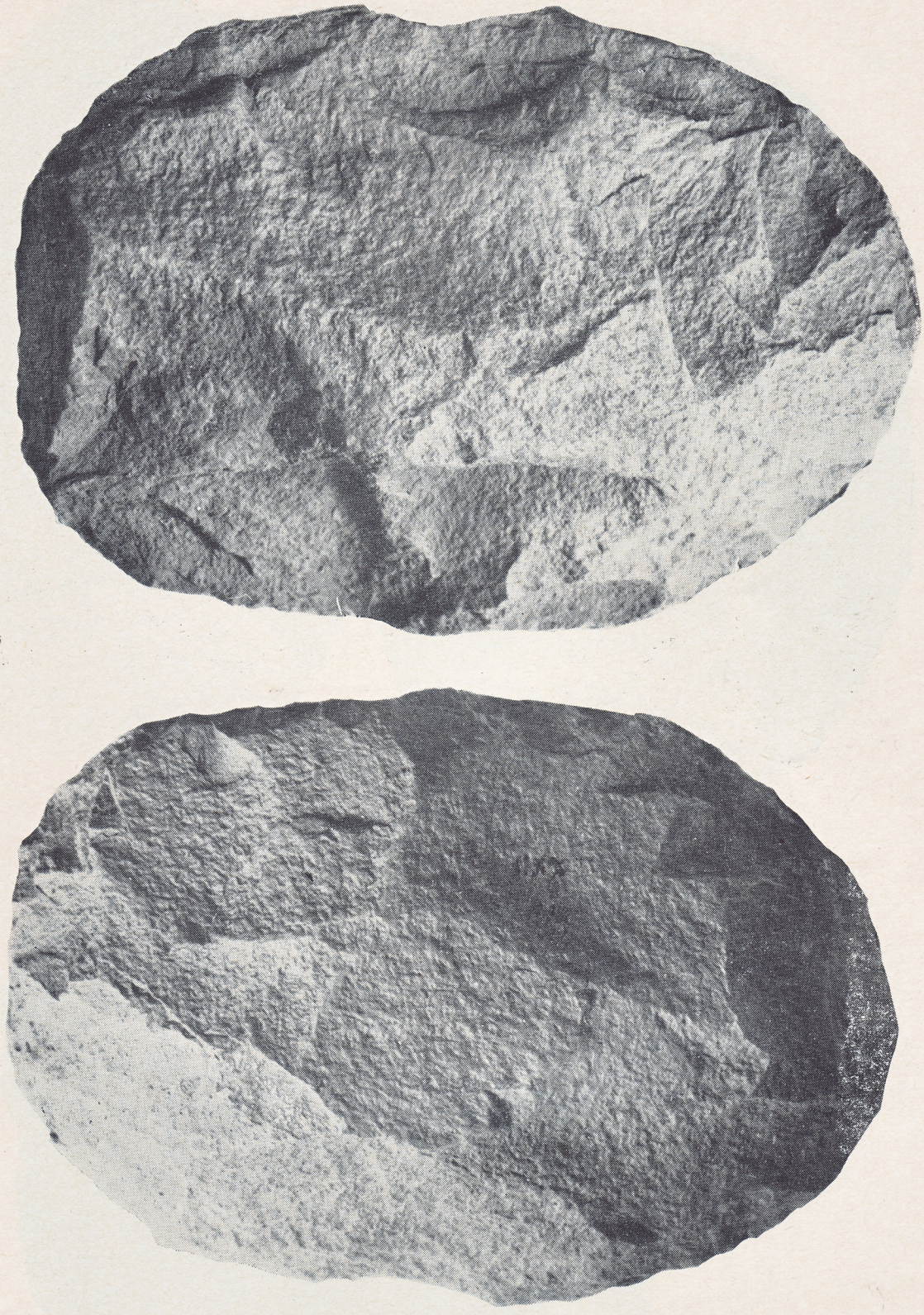


TAB. XIII. *Wilton River XXII. Reduced.*

TAB. XIV.

Wilton River XXII. Nat. Size.

TAB. XV. *Wilton River XXII. Nat. Size.*



TAB. XVI.

Wilton River XXII. Nat. Size.

1

2

TAB. XVII.

Wilton River XXII. Nat. Size.

2

1

TAB. XVIII.

Wilton River XXII. Nat. Size.

2

1

TAB. XIX.

Wilton River XXII. Nat. Size.

whose distal region is worked crosswise, obliquely, concavely or convexly, as a rule with steep trimming. In contrast to scrapers, their convex truncation is always asymmetrical, trimming is irregular (not parallel) and never tapers into a fan-shape. The lengthwist edge may be trimmed.

Truncated implements are to be found particularly often in all their forms in locality ES, where they are made from large blades and flakes, often trimmed bilaterally. Some of them are very similar to scrapers.

3.1. Truncated crosswise: *Pl.* VII/4 — a fragment of a strongly bilaterally trimmed blade, *Pl. VII/4* — bilaterally denticulated blade. In both cases the distal edge is narrower than the greatest width of the blade, which is probably exceptional.

3.2. Truncated obliquely. Occurs in small numbers in WR II, IIa, VII, ES.

3.3. Concave truncated is usually the most commen type in this group, which occurs especially in ES. Truncation may be asymmetrical in the distal part *(Pl. III/9)*, or symmetrical *(III/8)*. In ES there occur rather infrequently symmetrical truncations, often on thick flakes *(Pl. VII/2)* and blades, whose lengthwise edges are sheer *(Pl. VII/5)*, sometimes even concavely *(Pl. VII/8)* trimmed.

3.4. Convexly truncated implements are always few in number *(Pl. III/10)*.

3.5. Denticulated truncation is a type which must be distinguished in Australian assemblages, even if it is not too common. *Pl. VII/3* — crosswise truncation denticulated, the lengthwise edges trimmed. *Pl. VII/6* — crosswise truncation denticulated, the lengthwise edges also denticulated.

4. Side-scrapers (racloirs). Flakes, occasionally also blades, of which one or both lateral edges are worked dorsally or ventrally; in some types the distal edge may also be worked, in some cases the dorsal or ventral flat. Using the basic orientation of the instrument to the axis of percussion, it is possible to distinguish a series of morphological types. The trimming of the edges is low, high, sheer, scaled or stepped.

4.1.1. Side-scraper, simple, straight. One lateral edge is trimmed straight *(Pl. III/11, VI/5)*.

4.1.2. Side-scraper, simple, concave. One lateral side is trimmed concavely *(Pl. III/12)*.

4.1.3. Side-scraper, simple, convex. One lateral edge is trimmed convexly *(Pl. III/14, VI/6)*. The ratio between concave and convex side-scrapers is always opposite to the concave and convexe truncated tools; convex side-scrapers are always in the majority.

4.2. Transversal side-scraper. The distal (opposite the bulb of percussion), usually of a wide flake, is either straight, or convexly or concavely worked. *Pl. III/13* — transversal side-scraper, convex, with typical scale-like trimming.

4.3. Double side-scraper. Both lateral edges are straight, concavely or convexly trimmed. *Pl. III/15* — double side-scraper, convex/straight.

4.4. Off-set side-scraper. One lateral and the distal edges are worked, together making a point lying asymmetrically to the axis of formation. *Pl. IV/3* — off-set side-scraper with acute angle.

4.5. Convergent side-scraper. Both lateral edges are worked and converge approximatelly symmetricaly upon the axis of formation; the angle formed by the two edges is always larger than with points, in some cases the overall shape is irregular, and does not correspond to the definition of points. In the studied assemblages they occurred extremely rarely in WR VII and Gs.

4.6. Multiple side-scraper. Usually rectangular shapes, with all four edges worked, and also sometimes part of the distal face *(Pl. IV/1)*.

4.7. Ventral side-scraper. One or more edges are worked on the ventral side only. Two items of this type occurred, in Gs and ES.

4.8. Alternate side-scraper. One side worked dorsally and the other ventrally. One found in ES.

4.9. Two-sided side-scraper. One edge is worked dorsally and ventrally *(Pl. IV/2)*.

4.10. Bifacial side-scraper. Not only the edges, but also at least part of both faces is worked *(Pl. III/16)*. There may occur shapes completely worked on both sides, often pointed, which are distinguished from bifacial point only by their irregular measurements, thickness etc. In WR VII and WR II ovaloid to discoid shapes prevail, worked flat on both sides.

4.11. Double side-scraper, very high. Tools of approximately ovaloid lenticular shape, comparatively very thick, worked with sheer to stepped trimming over the whole length of both edges, so that the dorsal face is alvays for the greater part secondarily trimmed. All artefacts so characterized from Gs, G_3 and ES are fashioned from quartz, so that the question arises whether this type is due to the material used.

Pl. VI/13. Small, distal pointed, proximally curved tool.

Pl. VI/14. Approximately ovaloid, sheerly worked tool.

Pl. VII/6. Two-pointed tool with partially stepped trimming, corresponding to the idea of the limace of the European Middle Palaeolithic.

5. Burins. Blades, flakes or coroids, on which a sharp edge is formed at one end, placed at right-angles to the surface of the instrument. This working edge may be formed by two or more counter spalls, by unilateral spalls and counter trimming, or by unilateral spalls close to the break surface, to the dorsal side of the blade or to the cortex. The most suitable basic classification of burins is according to the manner in which the working edge is formed, into dihedral and truncated (spalled and scaled according to McCarthy, 1967, 35—36). Besides this it is possible to take into consideration the position of the burin edge (symmetrical to the axis, slanting, at a corner), the number of spalls on each side, and the shape of the trimmed edges (straight, concave, convex).

5.1. Dihedral (spalled) burin, formed by counter spalls.

5.1.1. Median spalled burin, the working edge approximately on the axis of the tool. *Pl. VI/9* — burin on a thick flake, right edge lengthwise con-

Liste of types of stone assemblages from Arnhem Land

		WR II	%	WR IIa	%
1.	Points				
1.1	Untrimmed points	19	5.79	5	2.70
1.2	Distally unilaterally trimmed points	10	3.05	4	2.16
1.3	Unilaterally trimmed points	18	5.49	13	7.03
1.4. 1—3	Bilaterally trimmed points	11	3.35	10	5.41
1.4.4	Bilaterally trimmed points with thick top	7	2.13	—	—
1.5	Unifacially flattened points				
1.5.1	Dorsally flattened points	21	6.40	7	3.78
1.5.2	Ventrally flattened points	1	0.30	1	0.54
1.6	Bifacially trimmed points				
1.6.1	Bifacially partly trimmed pints	—	—	7	3.78
1.6.2	Bifacially completely trimmed points	79	24.08	43	23.24
1.6.3	Large bifacial points	6	1.83	2	1.08
1.6.4	Ridged bifacial points	—	—	—	—
2	End scrapers				
2.1.1	Simple end scrapers	13	3.96	5	2.70
2.1.2	End scrapers with trimmed edges	1	0.30	—	—
2.1.3	Round scraper	1	0.30	—	—
2.2	Denticualted end scraper	2	0.61	—	—
2.3	Large and thick end scrapers	—	—	11	5.95
2.4	Core scrapers	—	—	3	1.62
3	Truncated implements				
3.1	Truncated crosswise	2	0.61	5	2.70
3.2	Truncated obliquely	2	0.61	1	0.54
3.3	Truncated concave	7	2.13	1	0.54
3.4	Truncated convexe	—	—	—	—
3.5	Denticulated truncation	1	0.30	2	1.08
4	Side scrapers				
4.1.1	Side scrapers simple straight	1	0.30	—	—
4.1.2	Side scrapers simple concave	6	1.83	8	4.32
4.1.3	Side scrapers simple convexe	3	0.91	—	—
4.2	Transversal side scrapers	—	—	2	1.08
4.3	Double side scrapers	3	0.91	—	—
4.4	Offset side scrapers	3	0.91	2	1.08
4.5	Convergent side scrapers	—	—	—	—
4.6	Multiple side scrapers	—	—	1	0.54
4.7	Ventral side scrapers	—	—	—	—
4.8	Alternate side scrapers	—	—	—	—
4.9	Two-sided side scrapers	2	0.60	—	—
4.10	Bifacial side scrapers	—	—	5	2.70
4.11	Double side scrapers, very high	—	—	—	—
5	Burins				
5.1	Dihedral (spalled) burins				
5.1.1.	Medial spalled burins	1	0.30	—	—
5.1.2	Angle spalled burins	1	0.30	—	—
5.2	Burins on broken blades	1	0.30	—	—
5.3	Truncated (scaled) burins				

vexly trimmed. *Pl. VIII/4* — Miniature bifacially worked tool, cortex at the proximal end, worked distally to a median burin.

5.1.2. Angle spalled burin, working edge approximately on the lengthwise edge of the tool *(Pl. VIII/1).*

5.2. Burin on a broken blade. A corner burin where the working edge is formed by one spall and the transversal break surface. Several of them occurred in WR II, Gs, ES.

5.3. Truncated (scaled) burin, made by spalling on one side and trimming on the other.

5.3.1. Truncated burin with concave trimming, occurring most frequently in all the industries described.

5.3.2. Truncated burin with convex trimming *(Pl. IV/4).*

5.3.3. Transversal burin, having either concave or straight-trimmed lengthwise edge, and the spall made across the blade or flake, so that the working edge is always at a corner. This type occurs in two examples in ES.

5.3.4. Multiple truncated burin, may have two working edges at one end *(Pl. V/1* with concave trimming) or at opposite ends *(Pl. VIII/3* with concave trimming). These are relatively rare forms in these industries.

5.4. Keeled burin, characteristic of the European aurignacoid industries, with the working edge formed by several curved spalls on one side, and by one spall or exceptionally by concave trimming on the other. In the assemblages described, fairly typical keeled burins, mostly with concave trimming *(Pl. VIII/2)* occurred in ES, occasionally in Gs.

TABLE III.

WR VII		G s		G 1		G 2		G 3		G 4		ES	
	%		%		%		%		%		%		%
10	2.58	19	8.44	2	7.69	—	—	—	—	5	8.62	18	3.17
13	3.35	1	0.44	—	—	—	—	1	1.45	—	—	4	0.71
14	3.61	8	3.56	—	—	—	—	—	—	—	—	4	0.71
15	3.87	9	4.—	—	—	5	7.25	3	4.35	1	1.72	16	2.82
—	—	—	—	—	—	—	—	—	—	—	—	—	—
35	9.02	3	1.33	—	—	1	1.45	—	—	2	3.45	10	1.76
3	0.77	4	1.78	—	—	1	1.45	—	—	3	5.17	—	—
24	6.19	7	3.11	—	—	—	—	1	1.45	—	—	8	1.41
130	33.50	38	16.89	1	3.85	19	27.54	19	27.54	16	27.59	18	3.17
6	1.55	—	—	—	—	—	—	—	—	2	3.45	—	—
—	—	3	1.33	—	—	3	2.90	1	1.45	—	—	—	—
5	1.29	3	1.33	—	—	—	—	1	1.45	—	—	14	2.47
3	0.77	—	—	—	—	—	—	—	—	—	—	16	2.82
—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	2	0.89	—	—	—	—	—	—	—	—	4	0.71
—	—	—	—	—	—	—	—	—	—	—	—	5	0.88
3	0.77	—	—	—	—	—	—	—	—	—	—	1	0.18
5	1.29	—	—	—	—	—	—	—	—	—	—	16	2.83
1	0.26	—	—	—	—	—	—	—	—	—	—	8	1.41
6	1.55	—	—	—	—	—	—	—	—	—	—	98	17.28
1	0.26	—	—	—	—	—	—	—	—	—	—	10	1.76
—	—	—	—	—	—	—	—	—	—	—	—	4	0.70
3	0.77	2	0.89	1	3.85	—	—	—	—	—	—	4	0.71
15	3.87	—	—	1	3.85	4	5.80	2	2.90	1	1.72	8	1.41
1	0.26	2	0.89	1	3.85	2	2.90	1	1.45	2	3.45	2	0.35
2	0.52	1	0.44	—	—	—	—	—	—	—	—	—	—
5	1.29	—	—	—	—	1	1.45	—	—	—	—	3	0.53
2	0.52	—	—	—	—	—	—	—	—	—	—	5	0.88
1	0.26	1	0.44	—	—	—	—	—	—	—	—	—	—
2	0.52	—	—	—	—	—	—	—	—	—	—	—	—
—	—	2	0.89	—	—	—	—	—	—	1	1.72	2	0.35
—	—	—	—	—	—	—	—	—	—	—	—	1	0.17
4	1.03	—	—	—	—	—	—	—	—	—	—	2	0.35
7	1.81	—	—	—	—	—	—	—	—	—	—	3	0.53
—	—	2	0.89	—	—	—	—	1	1.45	—	—	6	1.06
—	—	2	0.89	—	—	—	—	—	—	—	—	13	2.29
—	—	—	—	—	—	—	—	—	—	—	—	10	1.76
—	—	2	0.89	—	—	—	—	—	—	—	—	4	0.71

5.5. A special type of burin, to some extent falling outside the basic definition, is the flat burin. The working edge lies not across, but parallel to the surface of the break, and one or more spalls are always made on the ventral surface. Quite a large number of striking examples occurred in WR IIa, VII, G1 and ES *(Pl. IV/5)*.

6. Miscellaneous types.

6.1.1. Pièces esquillées. Bifacially chipped flakes with one *(Pl. IV/8)* or two opposite *(Pl. VI/10)* working edges. Only these flake tools exactly similar to those from the European Upper Palaeolithic, correspond to the original definition of outils écaillés (B a r d o n, J. & A. B o u y s s o n i e, 1906).

6.1.2. Coroid fabricators are similarly bifacially worked, most often with two working edges *(Pl. IV/7, 6, 8)*. These were not included in the definition of outils écaillés quoted, although a comparatively significant number of them occurs in some industries of the Upper Palaeolithic: they are usually referred to as chisels. These coroid implements are exclusively dealt with in the extremely interesting observations of J. P. White among the aborigines of New Guinea, where such artefacts represent the remains of so-called scalar cores (W h i t e, J. P., 1968).

6.1.3. Blade fabricators, ventrally chipped only unifacially, usually biliterally trimmed on the dorsal side, occurring only in ES *(Pl. VIII/10)*.

6.2. Notch: one or more non-parallelly concave trimmed places on the edges of a flake or blade. Such an tool occurred in almost all localities.

6.3. Denticulate: on one or more sides of

Continued

		WR II	%	WR IIa	%
5.3.1	Concave truncated burin	1	0.30	3	1.62
5.3.2	Convexe truncated burin	—	—	—	—
5.3.3	Crosswise burins	—	—	—	—
5.3.4	Multiple truncated burins	1	0.30	—	—
5.4	Ridged burins	—	—	—	—
5.5	Flat burins	—	—	3	1.62
6	Miscellaneous types				
6.1.1	Pièces esquillées	1	0.30	2	1.08
6.1.2	Coroid fabricators	—	—	—	—
6.1.3	Blade fabricators	—	—	—	—
6.2	Notches	1	0.30	1	0.54
6.3.	Denticulates	7	2.13	4	2.16
6.4	Awls	3	0.91	1	0.54
6.5	Partially flat worked artefacts	—	—	1	0.54
7	Elouera	3	0.91	5	2.70
8	Backed implements				
8.1	Backed bladelets				
8.1.1.	Bladelets backed unilaterally	—	—	—	—
8.1.2	Bladelets backed bilaterally	—	—	—	—
8.1.3	Bladelets backed alternately	—	—	—	—
8.1.4	Bladelets backed ventrally	—	—	—	—
8.2	Backed blades	—	—	1	0.54
8.3	Geometricized forms	—	—	—	—
9	Knives				
9.1	Untrimmed blades	—	—	6	3.24
9.2	Partly trimmed blades	3	0.91	—	—
9.3	Continuously trimmed blades	—	—	1	0.54
10	Fragments				
10.1	Fragments of blades partly trimmed	26	7.93	2	1.08
10.2	Fragments of bilaterally trimmed blades				
10.2.1	Proximal fragments	38	11.59	2	1.08
10.2.2	Distal fragments	—	—	—	—
10.2.3	Mesial fragments	1	0.30	—	—
10.3.1	Fragments of indetermated artefacts	3	0.91	1	0.54
10.3.2	Fragments of bifacially worked artefacts	14	4.27	—	—
11	Pebbles and coroids				
11.1	Worked pebbles	—	—	—	—
11.2	Percutors	—	—	1	0.54
11.3	Miscellaneous cores	—	—	10	5.41
11.4	Coroid fragments	4	1.22	3	1.62
	Total	328		185	

a flake or blade there is a row of parallel denticulated trimming *(Pl. IV/6)*. We have already come across denticulated trimming in end-scrapers, truncated implements, and points, and it seems to be a feature characteristic of the Australian industries, being much more common there than in the European Palaeolithic (with the exception of Mousterian à denticulé).

6.4. Awl: heavy, pointed or burinated working end, formed by either dorsal or alternate dorsal and ventral trimming *(Pl. IV/13)*.

6.5. Atypical, partially bifacially flat worked artefacts *(Pl. VIII/9)*.

7. Elouera. One of the few specifically Australian types, without comparison in the European Palaeolithic, is the elouera, well defined by F. D. McCarthy (1967, 26) and earlier by S. R. Mitchell (1949, 43). It was only possible in our collection to classify a few artefacts as elouera, and they were all drawn and described in detail.

Pl. VIII/5 — lengthwise flake with high triangular cross-section, the distal end broken off, on the left side a flat surface with sharp edge, the right convex side worked very steep, the edge irregularly denticulated on the ventral surface, proximally, the bulb of percussion, and smooth striking-platform, dorsal marks from previous blows, and at the left-hand side of the edge some trimming. It is the only piece of this type from El Sherano.

Pl. V/2 — pointed narrow flake with high triangular cross-section, the left side worked on the whole surface, the convex edge finely trimmed; the right-hand side is smooth, proximally there are the remains of the cortex. The existence of a ventral bulb of percussion is not certain.

Pl. IX/3 — similarly formed pointed artefact, with the worked section on the right, the convex

TABLE III.

WR VII		%	G s		%	G 1		%	G 2		%	G 3		%	G 4		%	ES		%
1	0.26		—	—		1	3.85		1	1.45		1	1.45		1	1.72		10	1.76	
—	0.26		—	—		—	—		—	—		—	—		1	1.72		2	0.35	
—	—		—	—		—	—		—	—		—	—		—	—		2	0.35	
—	—		—	—		—	—		1	1.45		—	—		—	—		2	0.35	
—	—		1	0.44		—	—		—	—		—	—		—	—		6	1.06	
3	0.77		—	—		1	3.85		—	—		—	—		—	—		5	0.88	
2	0.52		8	3.56		3	11.54		5	7.25		1	1.45		1	1.72		18	3.17	
1	0.26		7	3.11		—	—		5	7.25		3	4.35		2	3.45		3	0.53	
—	—		—	—		—	—		—	—		—	—		—	—		3	0.53	
—	—		2	0.89		1	3.85		—	—		—	—		2	3.45		1	0.18	
3	0.77		2	0.89		—	—		2	2.90		—	—		—	—		4	0.71	
—	—		—	—		—	—		—	—		—	—		—	—		—	—	
—	—		—	—		—	—		—	—		—	—		—	—		3	0.53	
—	—		—	—		—	—		—	—		—	—		—	—		1	0.17	
—	—		8	3.56		2	7.69		3	4.35		5	7.25		2	3.45		—	—	
—	—		7	3.11		3	11.54		3	4.35		3	4.35		3	5.17		1	0.17	
—	—		2	0.89		—	—		—	—		—	—		1	1.72		—	—	
—	—		—	—		—	—		1	1.45		1	1.45		—	—		—	—	
—	—		—	—		—	—		—	—		—	—		—	—		2	0.35	
—	—		—	—		—	—		—	—		—	—		—	—		1	0.17	
19	4.90		—	—		—	—		7	10.14		3	4.35		—	—		14	2.47	
2	0.52		—	—		—	—		—	—		1	1.45		—	—		6	1.06	
—	—		—	—		—	—		—	—		—	—		—	—		17	3.—	
11	2.83		1	0.44		2	7.69		2	2.90		5	7.25		2	3.45		22	3.88	
—	—		22	9.78		—	—		—	—		—	—		—	—		46	8.11	
—	—		3	1.33		—	—		—	—		—	—		—	—		6	1.06	
—	—		9	4.—		—	—		—	—		—	—		—	—		26	4.59	
24	6.19		30	13.33		7	26.92		3	4.35		12	17.39		10	17.24		37	6.53	
—	—		4	1.78		—	—		—	—		3	4.35		—	—		4	0.71	
—	—		—	—		—	—		—	—		—	—		—	—		3	0.53	
—	—		—	—		—	—		—	—		—	—		—	—		—	—	
4	1.03		3	1.33		—	—		—	—		1	1.45		—	—		3	0.53	
1	0.26		5	2.22		—	—		—	—		—	—		—	—		2	0,35	
388			225			26			69			69			58			567		

edge irregularly denticulated, the left region smooth, the edge sharp. The existence of a bulb is not certain.

Pl. IX/7 — narrow blade with triangular cross-section, the right-hand side bidirectionally worked, the proximal region from the ridge, the distal from the edge; the left-hand side is smooth, obvious bulb of percussion ventrally.

These three artefacts come from locality WR II.

The following drawings from locality WR IIa are orientated with the axis of the tool transversal so that the more steeply worked side is uppermost. They all have a triangular cross-section and roughly quadrangular to almost orange-quarter outline. The original position of the bulb of percussion cannot be determined.

Pl. IX/1 — short tool trimmed over almost the whole circumference; also several blows on the ridge in one place.

Pl. IX/2 — somewhat flatter tool worked on the whole of the dorsal side and trimmed on all four edges.

Pl. IX/4 — high tool, trimmed on all four edges.

Pl. IX/5 — high tool trimmed only on the steeply worked side, with convex edge; the opposite edge trimmed only partly on the right, the ridge chipped, the left-hand end broken off. It seems that the position of the bulb of percussion was originally at the right-hand end.

Pl. IX/6 — long tool, somewhat lower than the others, completely worked dorsally and partly ventrally, steeply trimmed edge, almost straight, opposite edge concave and finely trimmed, sharp.

Only these nine items from the whole collection correspond approximately to the basic definition of elouera, while it is evident that they are morphologically, and especially technologically, he-

terogenous artefacts. Two of them have a clearly preserved bulb of percussion *(Pl. VIII/5, IX/7)*, with three of them the position of the bulb of percussion is uncertain *(Pl. V/2, IX/3, 5)*, with the remainder there is no apparent trace of a bulb. With three of them it is possible to express the opinion that they originated with the breaking up of other artefacts, which is evidenced by the way in which one side is worked and by the smoothness of the other side *(Pl. V/2, VIII/5, IX/3)*. The long blade of which one side is bidirectionally worked (Pl. IX/7) is morphologically a typical core edge (lame à crête) of the European Palaeolithic, where, it is true, it usually appears without secondary trimming of the edge, but even examples thus trimmed are not exactly rare. If, therefore, it is possible to consider even these four artefacts as genuine elouera, then it is necessary to consider the technological subtypes: a) originating from the breaking of other artefacts, b) made from core edges.

The remaining five items, from locality WR IIa, are of a more definite nature, and can safely be considered to be elouera. Two of them, worked flat dorsally or even ventrally *(Pl. IX/2, 6)* represent shapes without analogy in the European Palaeolithic; it seems that in the context of the definition of elouera quoted, this manner of working is not exactly normal. The shape in *Pl. IX/4* seems to be fairly specific, occurring exceptionally in the European Palaeolithic; it could only be classifed in the group of side-scrapers. Nor would the form in *Pl. IX/1* be in any way surprising in the aurignacoid industries as a somewhat imperfect bilaterally trimmed end-scraper. In the same way *Pl. IX/5* would not be considered exceptional as a convex side-scraper with chipped ridge, in the manner of lame à crête.

By comparing artefacts classified as elouera with types from the European Palaeolithic; I wished to show that similar forms, about whose function we know nothing, are here classified into various traditional morphological and typological groups, and that therefore completely heterogenous elements can be included in the concept of elouera. The fact that the border between elouera on the one hand, and scrapers or backed-blade tool types on the other, is very unclear, was pointed out by D. J. Mulvaney (1969, 81).

8. Backed tools.

8.1. Bladelets, trimmed steep lengthwise, found only in Goomadeer. The trimming can be unilateral *(Pl. VI/2)*, bilateral *(Pl. VI/1, 3)* or alternately, dorsal-ventral *(Pl. VI/4)*, while not depending whether the trimming is straight *(Pl. VI/3, VI/4 left)*, convex *(Pl. VI/1)* or concave *(Pl. VI/2, VI/4 right)*.

8.2. Large blades, trimmed very sheer, occur in individual cases in the localities WR IIa and ES *(Pl. VII/13)*.

8.3. The only geometricized form to occur was a single large triangular point, concavely trimmed on the left and slightly convexly proximally *(Pl. VIII/7)*.

9. Knives.

9.1. Untrimmed blades of various sizes *(Pl. IV/9, VI/11)*.

9.2. Blades and flakes partly trimmed or worn *(Pl. IV/10)*.

9.3. Blades continuously trimmed uni- or bilaterally.

10. Fragments.

10.1. Fragments of flakes and blades partly trimmed or worn.

10.2.1. Proximal fragments of bilaterally trimmed blades *(Pl. VII/10)*.

10.2.2. Distal fragments of bilaterally trimmed blades.

10.2.3. Mesial fragments of bilaterally trimmed blades.

11. Pebbles and coroids.

11.1. Unifacially, bifacially, or alternately worked pebbles.

11.2. Percutors.

11.3. Miscellaneous cores.

11.4. Coroid fragments.

MACROLITHIC INDUSTRIES

The industries so far described from the localities Wilton River II, IIa, VII, Goomadeer and El Sherano represent assemblages of implements of normal, sometimes smaller (Goomadeer) size and type, of normal shape, roughly speaking occurring in many other regions of Australia. Apart from these, there were found in three localities of unusual shape and size. In WR II there is only a small number (6) mixed with the remaining finds, in WR IIa there was a similar small collection (13), found in a place at some distance from the main collection area (according to J. Jelinek's description). Only locality WR XXII provided an isolated collection of 95 macrolithic artefacts. I had no guide to their analysis; on the basis of morphological and technological criteria I distinguished 20 groups in WR XXII, representing possibly independent types, and I have arranged the small collections from WR II and IIa among them. Their characterization is by basic morphometrical information (length, width, thickness, length/width, width/thickness), summarized in graphs and numerical data.

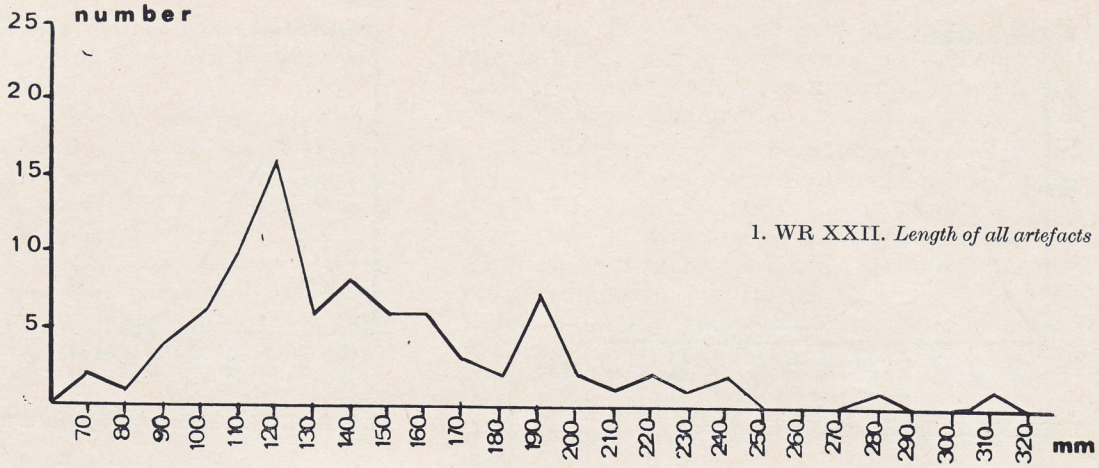
1. Rock pieces of naturally curved shape, but not pebbles, with one or two flakes chipped off, sometimes by shattering, but without shape.

2. Unworked flakes with bulb of percussion apparent and usually smooth and large striking platform. They have a discoid to long shape, and there are as a rule several negatives of previous flaking on the dorsal side, in one case only a cortex.

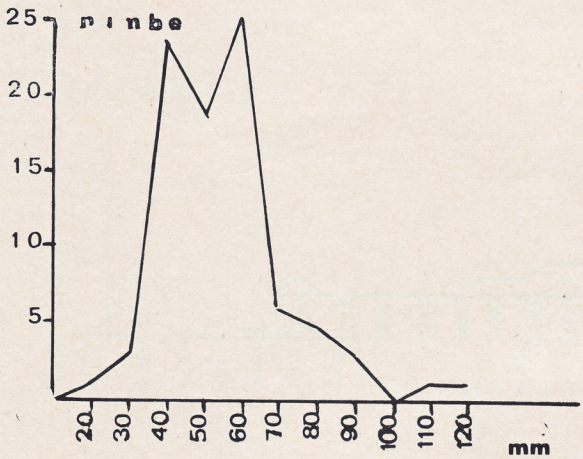
3. Side-scrapers: convex 9, double 1, alternate 1.

4. Heavy, long and roughly rectangular flakes, one lengthwise edge functionally trimmed on the ventral side, the opposite one made into a blunt back.

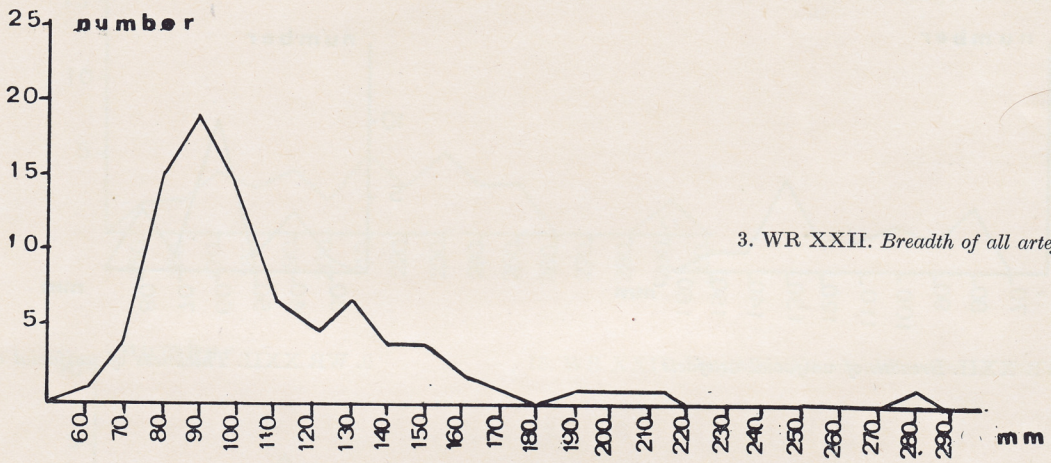
Pl. X — flake with bulb and smooth striking platform, the right ventral convex sharp edge completely worked as far as the distal end with flat trimming, the left edge roughly chopped, so that



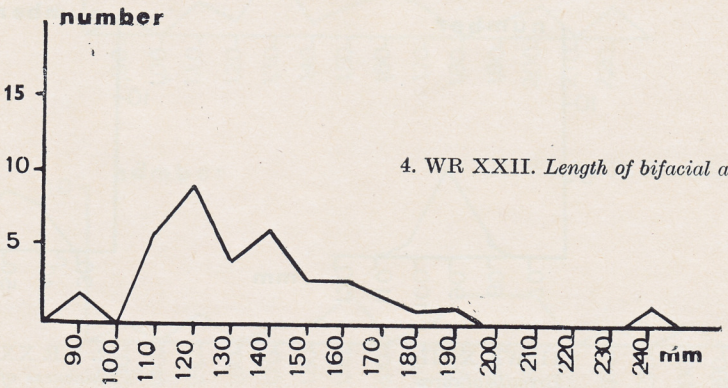
1. WR XXII. *Length of all artefacts*



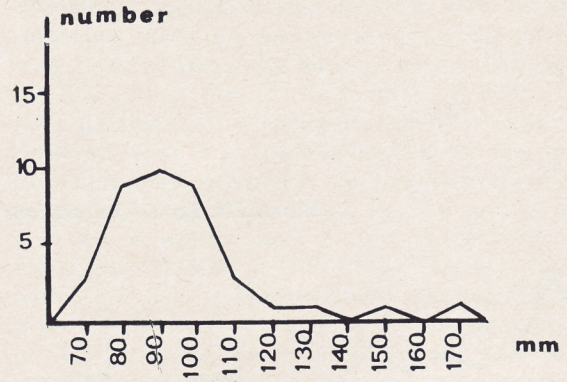
2. WR XXII. *Thickness of all artefacts*



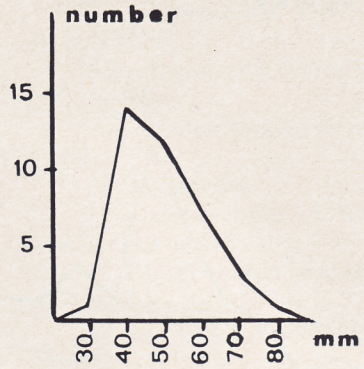
3. WR XXII. *Breadth of all artefacts*



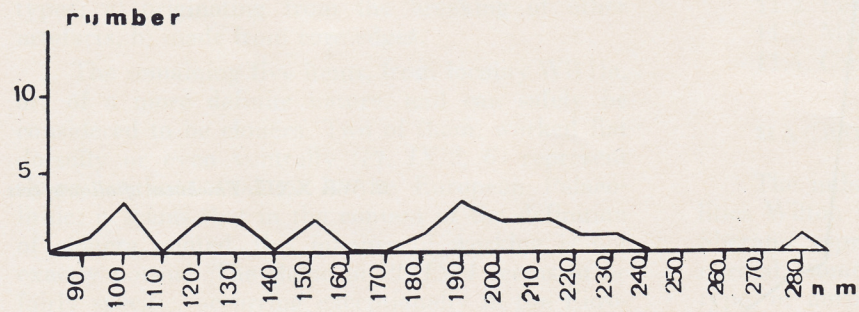
4. WR XXII. *Length of bifacial artefacts (types 7, 8, 9, 10, 11, 18, 19)*



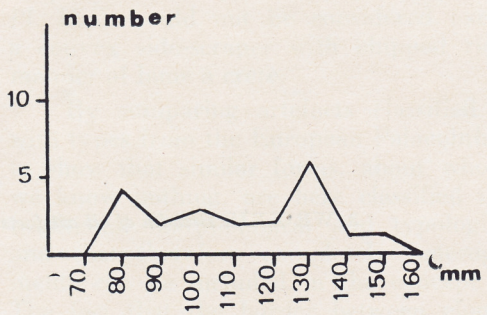
5. WR XXII. *Breadth of bifacial artefacts*



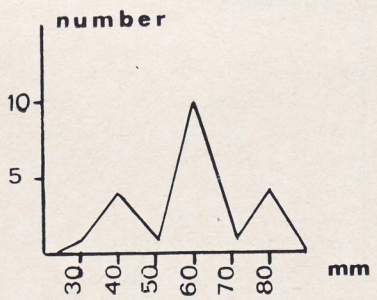
6. WR XXII. *Thickness of bifacial artefacts*



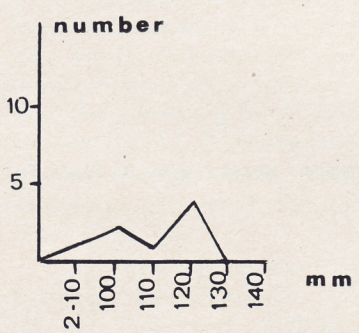
7. WR XXII. *Length of unifacial artefacts (types 3, 4, 5, 6, 12, 13, 14, 18)*



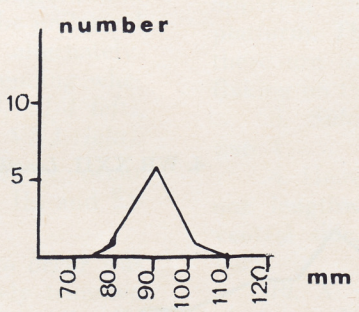
8. WR XXII. *Breadth of unifacial artefacts*



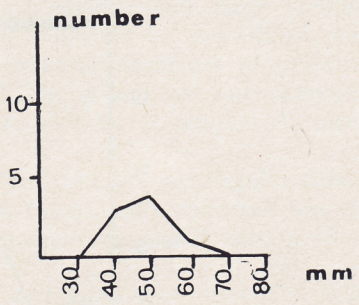
9. WR XXII. *Thickness of unifacial artefacts*



10. WR XXII.
Length of cores (types 15, 16)



11. WR XXII.
Breadth of cores



12. WR XXII.
Thickness of cores

together with the sloping right-hand part of the dorsal surface it forms a back. Most of the dorsal side has the original surface.

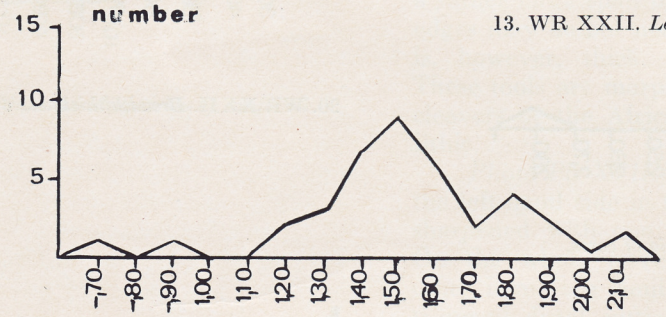
5. Heavy rectangular to ovaloid flakes, one lengthwise edge worked more or less convexly, sharply on the dorsal side; the opposite edge at least partly blunted, usually by lengthwise flaking and thus forming a blunt back *(Photo Pl. XIV).*

6. Thick flakes, mostly rectangular to ovaloid, along both lengthwise edges, and distally, obliquely steep, sometimes roughly denticulated. Ventrally smooth striking platform and bulb of percussion. On the dorsal side at least partly preserved cortex.

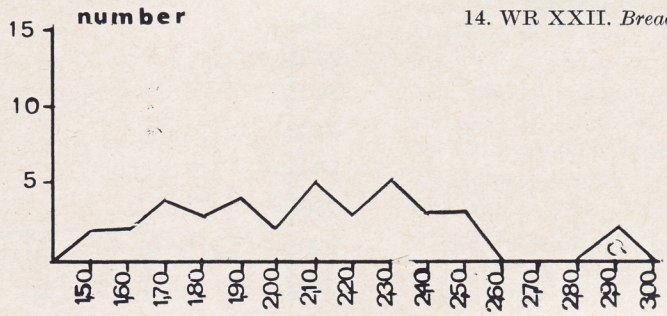
Pl. XI — thick ovaloid flake, very steeply chopped along almost the whole circumference, only proximally smooth striking platform.

Photo Pl. XV — almost rectangular, slightly curved flake, chopped steep and roughly denticulated on the whole circumference. Proximally smooth striking platform.

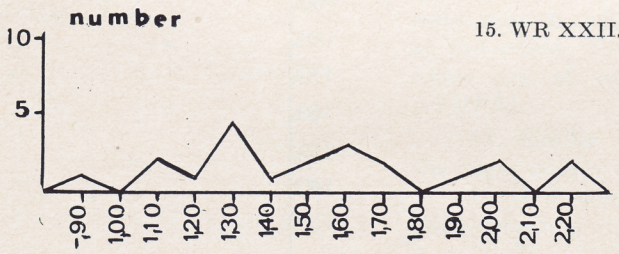
7. Tools, in most cases roughly ovaloid in shape, made from flakes worked bifacially only partly flat, so that there is in most cases ventrally the remain of a smooth striking platform and an obviously positioned bulb, while dorsally there sometimes remains part of the cortex. The cross-section is usually, therefore, asymmetrically biconvex, more rarely, planoconvex. The whole circumference of the edges is chipped from both sides, more rarely only dorsally, and not so sharp. Some of them were made from rock fragments without bulb.



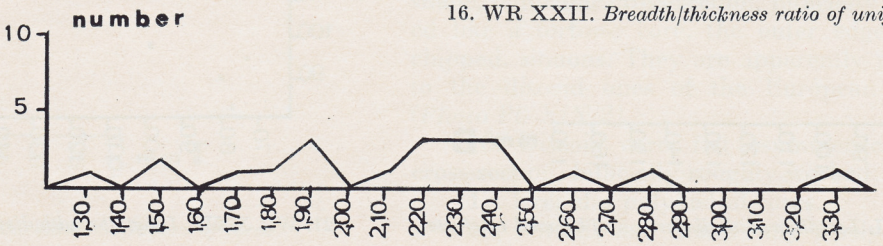
13. WR XXII. *Length/breadth ratio of bifacial artefacts*



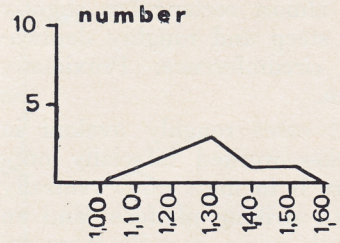
14. WR XXII. *Breadth/thickness ratio of bifacial artefacts*



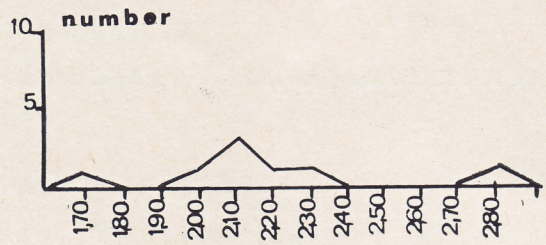
15. WR XXII. *Length/breadth ratio of unifacial artefacts*



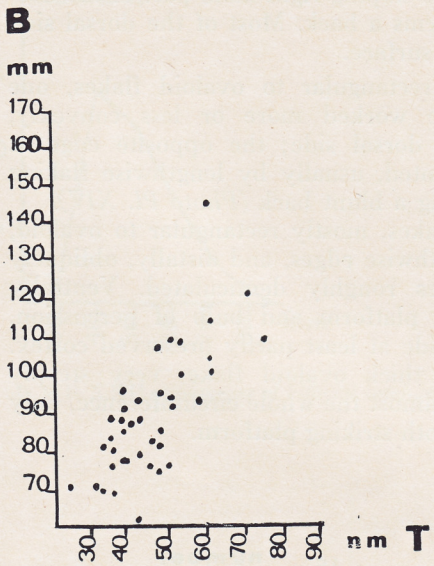
16. WR XXII. *Breadth/thickness ratio of unifacial artefacts*



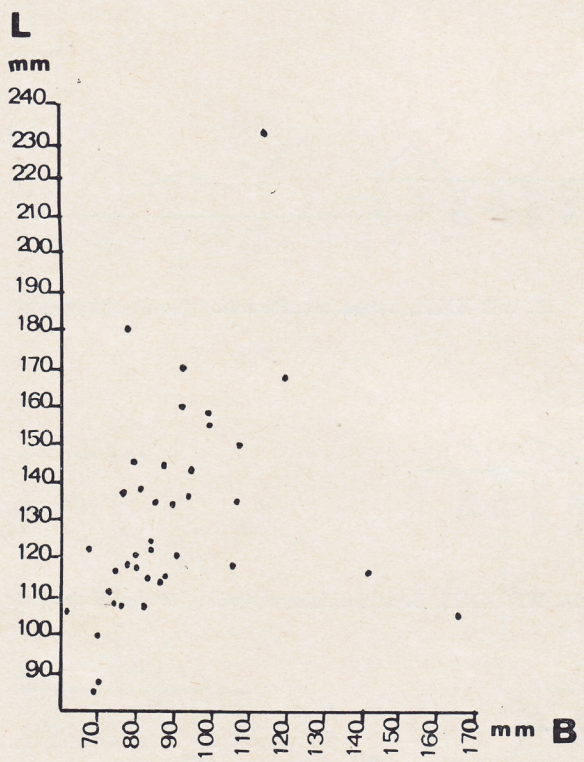
17. WR XXII. *Length/breadth ratio of cores*



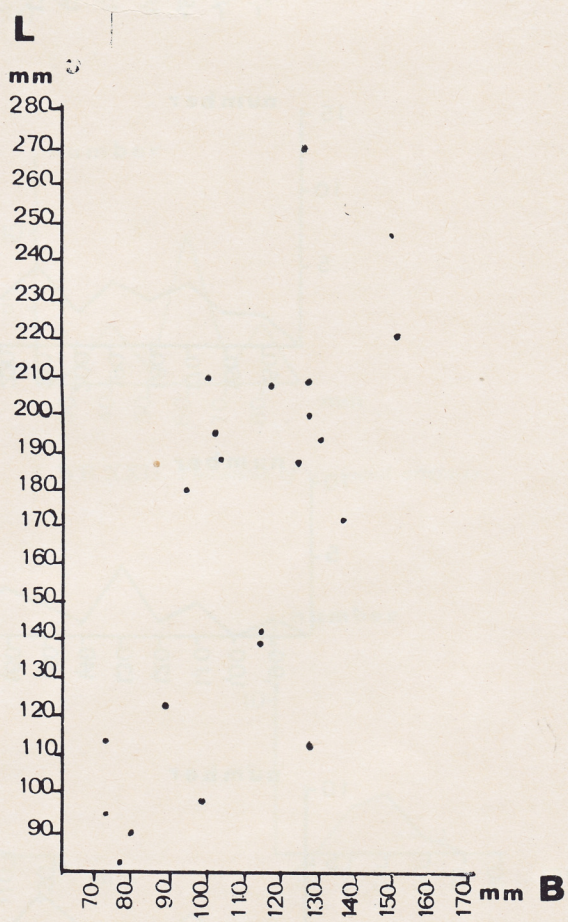
18. WR XXII. *Breadth/thickness ratio of cores.*



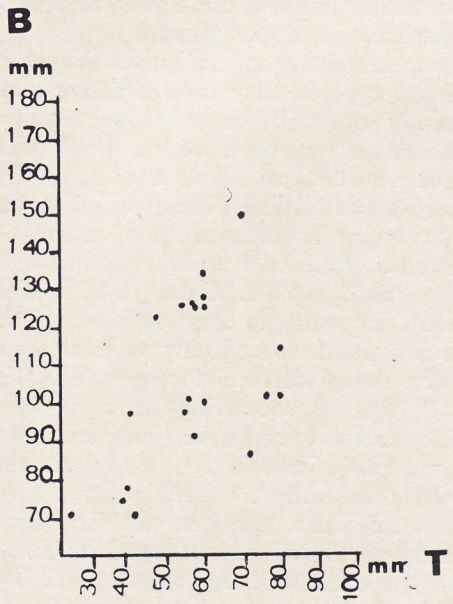
20. WR XXII. *Breadth/thickness dispersion of bifacial artefacts*



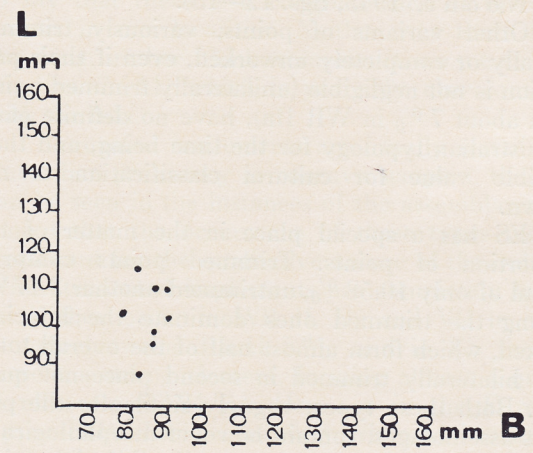
19. WR XXII. *Length/breadth dispersion of bifacial artefacts*



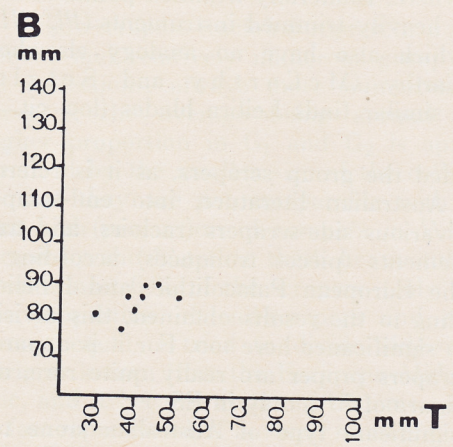
21. WR XXII. *Length/breadth dispersion of unifacial artefacts*



22. WR XXII. *Breadth/thickness dispersion of unifacial artefacts*



23. WR XXII. *Length/breadth dispersion of cores*



24. WR XXII. *Breadth/thickness dispersion of cores*

Pl. XII — ovaloid flake of planoconvex cross-section, dorsally chopped over the whole surface, ventrally only at the edges, in the middle the remains of a spliting platform, the whole circumference of the edge is chipped.

8. Similar ovaloid artefacts, but bifacially worked in such a way that it cannot be said whether they are from flakes or from coroids, cross-section biconvex, sharp edge chipped on the whole circumference *(Photo Pl. XVI).*

9. Bifacially flat worked artefact, approximately elipsoid in shape, bluntly pointed, outer edge slightly chipped.

Photo Pl. XVII/1 — morphologically is this a hand-axe, that has a subcordiform shape, exactly corresponding to the type from the Upper Acheulean in Europe.

10. Heavy flake, whose distal transversal edge is sharpened only dorsally or also ventrally by a rather large spall or by trimming. The lengthwise edges may be but need not be chipped, at least one is, however, thick, blunted, and forms a back. These tools are morphologically very similar to the cleavers of the African and Indian Lower Palaeolithic.

Photo Pl. XVIII/2 — broad flake with bulb on the left-hand side in the middle, distal oblique edge sharpened with one spall, left-hand edge blunted. On the whole a very typical cleaver. Both the other items are similar, the smaller has a dorsally trimmed distal cutting edge, the larger is chopped on both sides.

11. Bifacially worked thick coroids, roughly ovaloid, of which one lengthwise convex edge is functional, sharpened by trimming on both sides. The opposite edge is blunted. In horizontal cross-section the functional edge is sharp, the opposite area thickened. These implements can be classified as chopping tools *(Pl. XIII).* The second item is less typical, but substantially corresponds to this description.

12. Coroids on a roughly oval base, high-domed dorsally, slightly flattened and carefully worked in the distal region, proximally and along the sides very steeply and roughly chopped. Ventrally smooth, with the surface trimmed partly flat at the edges. These are typical horse hoofs. Both items are of nearly the same size *(Photo Pl. XVIII/1).*

13. Similar implements of less regular shape, the edges widely notched.

14. A discoid flake worked dorsally like a tortoise core, the edge notched, ventral striking platform, bulb not visible *(Photo Pl. XVII/2).*

15. Coroids of ovaloid or irregular rectangular shape, lenticular cross-section, bifacially flatly worked like a tortoise core, the outer edge sharp, unchipped, sinuous. They are apparently cores similar to the discoid ones of the European Mousterian *(Photo Pl. XIX/2).*

16. Discoid core, flat asymmetrical biconvex cross-section, bifacially roughly worked.

17. Irregular polyhedral cores.

18. Coroids and flakes only partly worked, or

defective; most are probably unfinished artefacts of types 7, 8 and possibly also 15.

19. Irregularly ovaloid to slightly rectangular items with biconvex cross-section, traces of working completely minimal or altogether absent, the whole surface curved and weathered *(Photo Pl. XIX/1).*

These are either natural shapes suitable for various artefacts in the very first stage of working, or even already worked, but secondarily extremely weathered items, so that the individual chippings of the face and edge are not recognisable. To decide which of these alternatives is more likely, it is necessary to start from a knowledge of local conditions.

From the other localities WR II and IIa comes only a small number of instruments of similar size, which could be classified among the types defined.

WR II:

3. Double side-scrapper; very flat end-scraper, only distally trimmed.

8. Ovaloid bifacially worked artefact with chipped edges, eliptical cross-section.

15. Bifacially worked coroid with almost planoconvex cross-section.

18. Two distal fragments: one flat, bifacially worked, one pointed with three-sided cross-section, roughly chopped at the edges.

WR IIa:

2. Flakes of various shapes.

7. Among these ovates there are four where the bulb lies on the side of the artefact, one of which is unusually thin. The largest item has an eliptical cross-section and is close to type 8.

10. Two large, comparatively thin and flat implements were classified as cleavers, their distal edge being more or less straight and sharp, the lengthwise edges chipped and partly blunted.

19. Two items can be considered to be natural or very weathered forms of type 8.

COMPOSITION OF THE INDUSTRIES

A morphological and typological analysis carried on the stone assemblages from Arnhem Land localities made it possible to get a fairly detailed picture of their typological content. The percentage of individual groups of types and even of some of the more specific single types shows that there exist qualitative differences between assemblages, which may have chronological or cultural significance.

The predominant element in most industries is trimmed point, which comprise 60 % in WR VII, 46 to 48 % in WR II and IIa, and fluctuate between approximately 30 % and 40 % in individual horizons in G. Then among these points bifacial flatly worked examples predominate, most of them of roughly triangular outline, with curved base, some keeled in the distal region. None of our points is denticulated which is characteristic of the Kimberley region of Australia (N o o n e, 1943), but M c C a r t h y (1967, 38—40) accepts both variants, denticulated and undenticulated, under the title Kimberley point. In WR II, IIa and VII there appeared heavy points similar to small hand-axes, and in Gs, G_1 and G_3 specific thick keeled points.

Apart from bifacially worked points the second most significant type is that only dorsally flatly trimmed, usually also with curved base and often keeled in the distal region; these are Pirri points proper (C a m p b e l l and N o o n e, 1943, figs. 1—10, C a m p b e l l, 1960). Their morphological and regional variant is Fulham Pirri, usually of smaller size and proximally thick (C a m p b e l l and N o o n e, 1943, fig. 11, C a m p b e l l, 1960, fig. 1d, 511 ff.). According to these authors, another Pirri variant is a point worked only unilaterally on one half of the dorsal surface (loc. cit. 1943, figs. 14—16, 1960, fig. 1i), occurring about 3 % as frequently as points trimmed over the whole dorsal surface (loc. cit. 1960, 520). In our list of types they are among the unilaterally trimmed points *(Pl. I/7, 9).* On the ventral side of the butt end the bulb of percussion has sometimes been removed by several small spalls (loc. cit. 1960, fig. 1c, our *Pl. II/4*). This does not, however, justify our considering biface trimmed tools as Pirri, among which toothed Kimberley points are also included (C a m p b e l l, 1960, 518); both authors, however, previous also recognised bifacially worked Pirri (C a m p b e l l and N o o n e, 1943, figs. 12—13).

Other variants of points, variously trimmed laterally or completely unworked, even if their proportion is not negligible (unilaterally trimmed points form about 7 % in WR IIa), have no definite place in Australian typology for the time being, and their possible value for cultural classification is not known.

ES has a special place in the matter of the proportion of points. Trimmed points comprise a total of only 10.58 %, untrimmed another 3.17 %. Among the trimmed ones dominate the bifacialy worked, which form almost half of the overall total, with bilaterally trimmed in second place not quite 3 %. Both these types, vaguely similar to the previous assemblages, contain however morphologically distinctive instruments. Among the bifacial points there is a certain number made of lyddite very thin, but most only partly worked, of imperfect shape and mostly fragmentary. Similar ones were not found elsewhere. Bilaterally trimmed points also include long, heavily trimmed instruments *(Pl. VII/1, 11, 12),* which also have no analogy elsewhere. F. D. McCarthy (M c C a r t h y and S e t z l e r, 1960) calls similar finds Leilira blades (loc. cit. *Pl. 12/1—4*).

I divided the group scrapers, as it is referred to in the Australian literature, into end-scrapers (grattoirs), various side-scrapers (racloirs) and truncated implements (pièces tronquées) according to usage in the European Palaeolithic, and I believe that according to the results obtained, this division has its own significance here too. For it is apparent that end-scrapers proper are really quite rare, and reach the figure of 7 % only in ES.

One significant type of Australian stone tool assemblages — tula-adze — in morphologically connected with the group of end-scrapers. The basic

shape of the tula (Cooper, 1954, 93, fig. 1) is quite typically grattoir sur éclat, which, of similar execution and size, would not be surprising in an aurignacoid context. The second stage also (l.c. fig. 2) and possibly even the third (l.c. fig. 3) would bear the same classification. The other three stages (l.c. fig. 4—6) would have to be described as variants of the transversale racloir, though these are shapes hitherto undescribed in the European Palaeolithic. From this it can be concluded that the function of European grattoirs sur éclat differed from the morphologically similar initial stages of tula-adzes. On the other hand it is certain that the typogenetical relation between the initial and the final stages of tula-adzes (l.c. figs. 1 and 6) as the product of intensive wear would be very difficult to demonstrate with fossil material, without recent hafted analogies.

Typical tula-adzes were not found in any of the collections described. I believe, however, that the series of heavy scrapers (type 2.3) from locality WR IIa is similar in function to the tula, since the straight to slightly concave shapes — consequently representing truncated flakes — are without doubt various stages of functional wear. All the examples are, however, morphologically different from the normally published tula forms, so that it is possible to say that there is a complete lack of tula-adzes proper in our localities. Neither was there found the long, rather thick scraper (Cooper 1954, 95, figs. 7—11) which is probably also connected with the tula.

Truncated implements are usually classified in Australian prehistory as concave scrapers, though it can be seen in the instances of the assemblages presented that the occurrence of these types may be significant for the qualitative nature of the industry. While truncated implements are completely lacking in G, they occur in WR II, IIa and VII in a percentage between 3 and 5 %, and in ES they represent a strong element, forming almost a quarter of all tools (23.94 %). Here, as in the European Upper Palaeolithic, concavely trimmed instruments predominate in this group in all localities, but the quantity of 17.28 % in ES is quite exceptional. We can say that truncated implements, especially the concave ones, represent one of the main types from El Sherano.

Side-scrapers (racloirs) represent a very heterogenous and relatively numerous group of types in all collections, always more numerous than end-scrapers, the average being around 10 %. The higher proportion in G_1 and G_2 is apparently influenced by the smaller size of the collection itself, so that they are not comparable with the others. The high proportion of scrapers in WR IIa is affected by the fact that these heavy tula-like items form almost 6 % of the scrapers. Only in WR II is the proportion of end-scrapers and side-scrapers almost equal. I tried to divide side-scrapers into variants known from the European Middle Palaeolithic, and it became apparent that most of them are in fact represented, if in small numbers only. Simple side-scrapers are more numerous, among which the convex, similarly as is the usual case in Europe, predominate, which is particularly apperent in WR VII. Three types are worth a special mention, being perhaps specifically Australian:

Type 4.6 — multiple side-scrapers trimmed over the whole circumference and also dorsally.

Type 4.10 — items which are obviously proximal fragments of points, subsequently reworked as side-scrapers were included among the bifacially flatly worked side-scrapers.

Type 4.11 — high double side-scrapers from quartz. Most of them are comparable to burren slugs according to McCarthy's description (1967, 27—28, fig. 11/6—10), which is supposed to be the residual stage of tula-adzes. From the point of view of the European classification some of them (e.g. *Pl. VIII/6*) represent completely typical limaces, or at least protolimaces *(Pl. VI/14)*. It would be interesting to observe their occurrence and spread in other Australian assemblages, and to discover the typogenetical process of their origin.

Burins also occur in heterogenous variants in all assemblages in a low proportion, between 1 and 2.5 %. ES is again the only exception, where they reach the figure of 9 %, and where the absolutely typical remains of burin production (burin spalls) was also found. All types of burin have their counterparts in the European Palaeolithic and are completely characteristically executed, even the double ones. Keeled burins (type 5.4) are worth a special mention, being common in aurignacoid industries. Flat burins (type 5.5) seem to be quite specific and comparatively numerous (cf. Campbell and Noone, 1943, fig. 44, 205, scaled burinate twins), if we bear in mind that they are only very rarely represented in even the most rich Palaeolithic collections.

The lack of all backed implements is surprising. Narrow blades, backed on one or both edges occur comparatively often in G; they are basically similar to the European lamelles à dos. One such atypical item was also found in ES; quite large steeply trimmed blades occurred in ES (2) and in WR IIA (1). The only instrument of geometrical shape, a largish triangle, came from ES. Neither microlithic tools of geometrical shape nor Bondi points were found on any site. Only a single small convex side-scraper from G_2 *(Pl. VI/6)* is morphologically similar to the Bondi point, but its working is not steep, backed, but more flat. The concept of the Bondi points is, however, also particularly broad, since apart from the perfectly curved points backed on the whole of one edge, there are also partly distally trimmed examples, which are likewise so described (Mitchell, 1949, 59, fig. 24 — assymetrical points, McCarthy, 1967, fig. 24), which quite certainly represent several different types (e.g. McCarthy, l.c., fig. 24/127, 129, 130, 132 — similar to the simple truncated points of the European Mesolithic).

A normal element in Australian industries, more common than in the European Palaeolithic, seem to be the various types of pièces esquillées, whose proportion fluctuates between 0.30 % in WR II to 14.50 % in G_2. As a matter of interest, it may

be mentioned that the term "fabricator", normally used for this type in Australia, is applied in the South African Late Stone Age to objects morphologically and technologically quite different (Sampson, 1970, figs. 13—16), so that the meaning is confused. Campbell and Noone (1943) use the term "biface punch" or "wedge" (l.c. figs. 46 to 47, p. 295) for coroid fabricators *(type 6.1.2)*.

In the group knives — which are basically primary flakes and blades — there are also those which can be called Leilira *(Pl. VI/11)*. Most often only largish untrimmed blades are considered to be Leilira, but sometimes also regularly bilaterally trimmed points or various untrimed small blades and flakes, that is completely different elements, so that the concept of the Leilira would require pinpointing. Finally it can be stated that all pebble tools or core tools are so infrequent and insignificant in our assemblages that they are of no importance for their overall classification. This applies also to horse-hoof scrapers or cores, which are usually rather important in other groups.

CHARACTERISTICS OF INDIVIDUAL UNITS

Goomadeer. The entire collection is composed of five assemblages, surface and layers 1—4, of which G_1 is so poor that it is not possible to pay attention to the percentages calculated. There is no doubt that all five assemblages represent mutually interconnected consecutive phases of one cultural cycle. This is evidenced by the similarity of the morphological and typological indications. The industry as a whole is relatively heterogenous, on average smaller than the others. The proportion of trimmed points is medium (30—40 %), with a preponderence of bifacially worked points and with a small number of dorsally worked ones of the Pirri type. There is an insignificant proportion of end-scrapers (1—2 %) and a low, variable proportion of burins (1—4 %), while there are quite a lot of side-scrapers (more than 10 %) and pièces esquillées (5—14 %). Backed bladelets of various types are a specific feature and perhaps also keeled bifacial points. Of the negative indications, the absence of truncated implements and elouera may be mentioned.

Wilton River VII. A characteristic industry with a high proportion of trimmed points (more than 60 %), with bifacial points (33 %) clearly dominating, and a significant proportion of unifacial Pirri points (9 %). Among the remaining types no specific form appears; side-scrapers are relatively uncommon (c. 11 %), also truncated tools (3.35 %), end-scrapers (2.83 %), burins (1.29 %) and pièces esquillées (0.78 %) in comparatively small numbers. There are no backed tools or elouera. It seems that this composition is completely characteristic of this type of industry.

Wilton River II, IIa are collections similar to each other. The proportion of trimmed points is higher (< 50 %), bifacial ones predominate (about half of all points, 23—24 %), besides unifacial Pirris, however there occur in roughly the same number unilaterally or bilaterally trimmed ones. The proportions of burins, truncated tools and pièces esquillées are not too different from WR VII, end-scrapers are somewhat more numerous and side-scrapers somewhat less. A specific type in WR IIa are the heavy scrapers, perhaps functionally close to tula-adzes *(type 2.3)*. Backed tools, with one exception, are absent, elouera are typical in WR IIa, atypical in WR II. It can be assumed that these two similar industries belong to the same cultural cycle as WR VII.

El Sherano. It is a collection strikingly different from all the preceding ones. The artefacts are of greater size than all the previous ones, long blades are especially striking. The proportion of trimmed points is low (c. 11 %), of which bifacial ones form more than a third (4.58 %), bilateral (including the so-called Leilira) 2.82 %, unifacial Pirri-like ones 1.76 %. Scrapers (7.05 %) and burins (9.52 %) are more numerous than elsewhere, esquillées (4.23 %) more than in Wilton River, while the number of side-scrapers remains around 10 %. A strikingly specific type, relatively richest, is the truncated implement (23.99 %) and then trimmed blades, although often fragmented (17.01 %). One slightly untypical elouera occurred.

We may therefore state by way of summary that the stone industries from Arnhem Land localities which are presented represent probably three typologically different cycles:

— Goomadeer
— Wilton River
— El Sherano.

It is much more difficult to judge the macrolithic artefacts coming from WR XXII. On the basis of definition of types it is possible to state only that the main technological tendency of this assemblage is the manufacture of bifacially worked implements of ovaloid-discoid shape, with the working edge around the whole circumference, whether there are worn tools *(types 7, 8)* or cores *(type 15)*. The second largest group comprises tools with one sharp edge worked *(types 4, 5, 10, 11)*, whose function can be most reasonably assumed to be that of chopping-tools. The remaining types, small in number, are morphologically and functionally various; side-scrapers, cleavers, hand-axes, horse-hoofs etc. With the pieces whose entire circumference is very steeply chopped, of type 6, there arises the question whether these are not axe blanks; in any case this is a morphologically and possibly functionally independent type. A morphometrical analysis, whose results are presented in the appended *graphs no. 1—24*, shows that bifacial types *7, 8, 9, 10, 11, 18* and *19*, form a homogenous morphological group, to which cores of types *15* and *16* are similar or almost identical. On the other hand unifacial types *3, 4, 5, 6, 12, 13, 14* and *18* form diverse, mutually different sub-groups. It seems that the basic tendency of this industry is to form bifacial instruments of various types.

We may perhaps conclude our analysis as follows, that the industry from WR XXII is, in spite

of its very rough nature, typologically extremely varied, and contains, apart from the dominant specific forms *(types 4—8)* morphological reminiscences of the Lower Palaeolithic (hand-axe, cleaver) and of the cores of the Middle Palaeolithic *(type 15)*. In view of the fact that no instruments of normal size and type were found in this locality, we cannot put them in the context of the remaining assemblages from the Wilton River area.

The small number of similar macrolithic implements from localities WR II and IIa is also an insufficiently definite illustration of their relation to the remaining industries, since according to the report of J. Jelínek, the circumstances of discovery, at least in WR IIa, make it possible to think in terms of two independent units. It will, therefore, perhaps be simpler to consider the macrolithic implements from WR II and IIa as an independent phase of settlement, at least until can be proved otherwise.

CULTURAL CLASSIFICATION AND ANALOGY

The attempt to classify the assemblages from Arnhem Land described here into the overall development of Australian pre- and protohistory depends directly on the literary sources available to me. In the bibliography I give all publications which I had at my disposal, even where they are not cited separately in the text, since they allowed me to penetrate at least partly the problem of the history of the settlement of this continent.

For comparison with our studied industries, the most interesting assemblages are those from the Arnhem Land region, or at least from the Northern Territory as a whole; this region is, however, at the moment unfortunately little explored. One of the best publications on Arnhem Land describes the results of an expedition where the archaeology was done by F. D. McCarthy and F. M. Setzler (1960). Disregarding the somewhat different methods of classification of these authors, we may exclude from our comparison the small collections from Yirrkalla and Jelangbara, with a predominance of uniface Pirri points (l.c. 223 ff.), since they have no analogy in our material, and confine ourselves in this study to the localities of the Oenpelli region, summarized in the table of implements (l.c. 274). Especially interresting for us are the somewhat richer collections from Oenpelli sites 1, 3 and 6, where there is a relative predominance of bifacial points or of flake fabricators and a high proportion of side-scrapers. This composition is reminiscent of Goomadeer, with the difference, however, that there is a significant number of elouera adze flakes, which are even predominant in other localities (Unbalanja-surface, Argaluk Hill sites 1 and 2). This difference is certainly a telling one, even if we consider the circumstance that our classification of elouera was, on account of lack of experience with this type, certainly on the narrow side, for fear of contamination by polymorphic objects (cf. McCarthy and Setzler, 1960, Pl. 8, 10). As a result of this comparison we can say that only Goomadeer is apparently close to, even though not identical with, the Oenpellian culture.

Mrs. C. White presented a detailed study of the stone industries of Arnhem Land in her unpublished Ph. D. thesis (White, 1967a), part of which we obtained as a photocopy thanks to the kindness of Mrs. J. Flood. C. White dug in the region of Oenpelli five rock-shelters, differing in their geomorphological position on the plain (Malangangerr, Nawamoyn and Padypadiy), and in the plateau-valley (Tyimede, I, II). In the upper layers of the sediments of all the rock-shelters a point-scraper assemblage together with edge-ground axes was found, in which the proportion of biface points is as much as 33% (similarly as in WR VII); very occasionally serrated Kimberley points occurred (according to the letter from Mrs. C. White of 6/6/1971). Rectangular scrapers are typical, probably similar to our type 4.6, which is, however, represented only in very small numbers, in WR II and VII. From Tyimede I, level III, an end-struck scraper is illustrated, unifacially trimmed (l.c. fig. VI/23), which is completely analogous to the backed bladelet of my classification, from Goomadeer.

The lower layers of Malangangerr, Nawamoyn and Tyimede II contained early industry with thick-sectioned clumsy scrapers, utilised flakes and edge-ground axes (White, 1967, a, b, 1971, White and Peterson, 1969).

In the El Sherano region J. Golson dug a rock-shelter at Sleisbeck, whose stone industry was analysed by C. White. She found neither elouera, nor tula, nor burren adzes,; from the upper levels come large blades, gathered also on the surface in that area, which could be analogous to our collection (letter of Mrs. C. White—Steiger of 6/6/1971). According to the opinion of Mrs. J. Flood, Golson's collection from Sleisbeck is similar to the Tandanjal Cave collection (letter from J. Flood of 7/5/1971).

Information concerning the excavation at the Yarar rock-shelter in the Northern Territory (Flood, 1970), where a rich stone industry was obtained, is important for us. Of 1340 completely retouched implements, 95% consists of points; approximately the same proportion of points occurs in nearly 4000 brokem pieces (l.c. 34). The author carried out a detailed multi-variant analysis on them, using a computer, and found that unifacial points are predominant, approximately in the same proportion of biface and intermediate points. She then designates the unifacial points as Pirri (l.c. 47). The other tools are represented in very small numers. They are mainly the various types of scrapers (nosed, concave, discoidal and semi-discoidal end-scrapers and side-scrapers). Three burren adze flakes, one leilira fragment, untrimmed points and various trimmed flakes, also cores, bifacial blanks and ground-edge axes, where also found.

In the Yarar industry there is, similarly as with our finds, a lack of elouera, tula and leilira, and on the other hand various end-scrapers and side-scrapers also appear along with points as the

most significant type. The difference in the proportion of bifacial and unifacial points is, however, substantial, even if we consider the fact that our classificational criteria are different to those of F. M. Flood, because even those only marginally trimmed are included in her unifacial types. The dominance of bifacial points, especially in WR and G, is, however, a completely characteristic feature.

N. W. G. Macintosh (1951) carried out an important excavation in Tandandjal Cave in the Northern Territory, whose stone industry was studied by F. D. McCarthy (1951). The sufficient number of chipped tools in group 1 (surface, layers 1, 2), typologically classified (l.c. 211), enabled me to calculate the percentage composition for comparison with our finds. Points are, it is true, relatively the most common (35.61 %), but bifacial ones form only 2.81 %, and unifacial Pirris 2.28 %; most numerous are the bilateral marginally trimmed (14.61 %) and various fragments. In second place are scrapers (grattoirs and racloirs), which are in the proportion 27.89 %, which is more than in any of our collections. Untrimmed leilira (8.68 %) are comparatively numerous, and untrimmed blade-knives (7.76 %). Among the concave and nosed scrapers (5.94 %) there are, according to the description, also concave and truncated implements similar to ours from ES. Burins form only 1.83 %, tula-adzes 2.28 %. We can see that even this assemblage is quite strikingly different from all of ours, especially in the lack of bifaced points, the high number of scrapers and leilira, the occurrence of tula-adzes and the absence of pièces esquillées.

A further important excavation was carried out by J. D. Mulvaney at Ingaladdi, Northern Territory, the results of which have not yet been published in detail. Individual data are drawn from the author's synoptical book (Mulvaney, 1969). It appears from this that the largest stratified collection among several thousand trimmed implements found was tula-adzes flakes, together with the point industry (bifacial and unifacial, l.c. figs. 25 and 26) in the upper layers of the sediments (l.c. 114 ff.). From the lower layers comes an assemblage of heavy scrapers and coroid implements (l.c. 147 ff.). The industries from WR and G may be close only to the younger layers of Ingaladdi 1, even if there are, of course, significant differences in typological composition.

According to the written communication of Prof. J. D. Mulvaney (letter of 19/5/1971) artefacts similar to our concave truncated from ES also occur in the surface collection and from excavation at the Kintor Cave near Catherine, N. T.

Important for our purposes is the significant reference to the Kimbereley biface point from a study concerning the spread of stone tools among the aborigines of Western Australia (Davidson and McCarthy, 1957). The authors presume its recent spread from Kimberleys (l.c. 449), but it seems that the stratified and C-14 dated assemblages from the Northern Territory and Arnhem Land are in contradiction to this hypothesis, since they show relatively very old origins of the bifacial technique.

For further comparison, it would perhaps be interesting to take the results of the excavation of R. V. S. Wright at Laura and Weipa, Cape York north-east Australia, whose publication of 1954 (McCarthy, 1967b) is not, however, available to me.

Much better investigated is the south-east region of Australia (Victoria, New South Wales, south-east South Australia and south-east Queensland), whence a series of excavated and C-14 dated sites is well-known, and where it was possible to define several spatially and temporally defined cultural cycles. Basically, it can be said of them that, similarly as in the Northern Territory, there are here older assemblages formed by heavy coroid and end-scraper like implements (Koonalda Cave, Kangaroo Island, Keilor, Capertee, Lake Menindee, Tartanga, The Tombs, Keniff Cave), where the younger layers also contain unifacial Pirri points, Bondi points, geometric microliths, eloueras, etc. (Mulvaney, 1961, 1969, McCarthy, 1967). The sites from Arnhem Land we have described are, however, typologically different to such an extent, especially in the occurrence of the characteristic biface trimmed points, that more detailed comparison would not produce meaningful results.

I believe that in conclusion it is possible to express the opinion that the group of assemblages from Wilton River (sites VII, II and IIa) form an independent, genetically mutually dependent cycle, which may be close to the Kimberleyan (McCarthy, 1967, 89, 92) and to the industries from the Oenpelli region described by C. White.

In Goomadeer there are to be found several phases of the development of an industry similar to the Oenpellian, and El Sherano represents a completely exceptional assemblage, different from the preceding ones, which may be similar to the industry from the upper levels of the Sleisbeck deposit (according to the letter of C. White of 6/6/1971) in the same region. I am unable to say to what extent these different groups represent indepent distinct cultures in the archaeological sense or only genetically (chronologically), chorogically (regionally) or ecologically based facies of one cultural complex.

If it was difficult to classify the assemblages of normal types into the framework of known Australian cultures, then it is even more difficult to find a comparison for the macrolithic assemblage from WR XXII. The large coroid tools are well known in Australia. As a rule they are chipped from pebbles and worked on one side only (e.g. Mitchell, 1949, fig. 28, 67 ff., McBryde, 1965, Pl. II, McCarthy, 1967, 43 ff., Mulvaney, 1969, 143 ff., fig. 35), in which they are basically different from our biface block instruments. Biface coroid axes fashioned from quarried lumps of stone are apparently more similar, as mentioned by McCarthy (1967, 46), but none is illustrated. S. R. Mitchell (1949) called them biface block

axes and flint choppers, Buandik type (l.c. figs. 32, 33, p. 73 ff.), which were used among the aboriginal tribes in South West Australia and Victoria. Such biface implements are mentioned by P. de S. Stapleton (1945) as coming from several localities in the south-east region of South Australia, and he divides them into three classes: A — made from nodules, worked (flaked) only partly bifacially, B — made from tablets, worked on both sides, only on the edges, C — flaked all over. The objects of class B (l.c. figs. 6—9) particularly remind us of type 7.

Artefacts from Mornington Islan, Queensland, which the author calls picks (Tindale, 1949) are morphologically, typologically and functionally apparently different from those of WR XXII.

There is, of course, another alternative, which was pointed out to me by Prof. J. D. Mulvaney (letter of 3/2/1971), that ours might be a case of axe blanks. Material from quarries (Mitchel, 1949, Pl. I) is unfortunately unknown to me, and I found pictures of axe blanks only without further description (McCarthy, 1967a, fig. 29, Mulvaney, 1969, 170 ff., Pl. 64, 65), so that I am unable to offer an answer to this question. The detailed working of the surfaces and edges (which are functionally worn?) of our ovates (types 7 and 8) indicates that finished implements are involved, as also the presence of other types (racloirs, cleavers, chopping tools). I know no analogy for the flake tools (types 4—6); Mitchell mentions aropia among such objects (l.c. fig. 30/1, p. 73) (cf. Tindale and Maegraith, 1931, figs. 6, 7 from the Kangaroo Islands, and the recent analogy from the Iliaura tribe of Central Australia, fig. 10), which is morphologically completely different, grattoir-like.

The industries from WR XXII, as a whole, especially if we admit that there are really no small instruments of current types in it, and that this is not exclusively a quarry site, has, as far as I know, so far no analogy in Australia. Such large implements were previously described by Australian researchers as the Sumatra type; their possible origin in the Indonesian regions of South-East Asia was mooted, and analogies were sought even in Tasmania (e.g. Tindale, 1937). More recently I. McBryde (1965) and other authors (cf. Mulvaney 1969, 146 ff.) have pointed out the morphological similarity of uniface pebble tools to the Hoabinhian of South-East Asia. The Hoabinhian is basically a pebble industry with a predominance of uniface implements; detailed analysis and definition of types is, however, so far unavailable, even though there are many cases of very rich assemblages (Matthews, 1966, Boriskovsky, 1966, a, b). In some works, there are, however, references also to biface hand-axes (van Heekeren, 1967, 69, 74; van Heekeren and Knuth, 1967, fig. 20), and oval-shaped tools (van Heekerên and Knuth, 1967, Pl. 9), which are really similar to our types 7 and 8. In Sai Yok there are also high-domed horse-hoofs (l.c. fig. 11, fig. 13), occuring also in WR XXII. Even if the problems of Hoabinhian have not yet been clarified in all detail (Mathews, 1966, Solheim, 1969), we can perhaps at least judge that the Australian uniface pebble tools of the Clarence Valley type represent a continuation of its technological tradition. The industry from WR XXII may then be considered an example of the same technology applied to other raw materials, while the function of the uniface and biface tools was probably the same. If we reject this hypothesis of a direct Hoabinhian tradion in Australia, we must then presume that the hitherto well-known Australian pebble-tools (and also industries of the WR XXII type) developed independently, and convergently from older roots of a similar technology. With regard to the spread of Hoabinhian in Indonesia (van Heekeren, 1957), however, the transfer of a stimulus from this region seems fairly likely.

CHRONOLOGY

During investigation of the temporal classification of the assemblages from WR, G and ES, which were obtained mostly by surface collection and do not themselves bear any aid to dating, we may rely on the comparatively large series of C-14 dates from various regions of Australia (McCarthy, 1967, Mulvaney, 1969, 178 ff.). All our assemblages, with the exception of the macrolithic complex from WR XXII and the corresponding artefacts from WR II and IIa, contain points, and therefore fall into the cycle of the hafted technology in the sense it is used by J. D. Mulvaney (1969, fig. 38). In all assemblages appeared ground axes. In the southern and eastern regions of Australia, there appear assemblages with points during the course of the third millenium B.C. For Arnhem Land, however, there exists only information from Nawamoyn, shifting the appearance of points to the beginning of the fifth millenium B.C. (7110 ± 160 B.P. ANU-53); the most similar younger date comes from Malangangerr (5980 ± 140 B.P. GaK 627) (White, C., 1967). These dates also give our assemblages their lower limit. From other localities in the Northern Territory we know industries with points much later: Yarar 3350 ± 90 B.P., V-72 (Flood, 1970) Ingaladdi 2890 ± 73 B.P., ANU-57 (Mulvaney, 1969).

If we can also take into consideration typogenetical criteria, for which, however, there are no objective scales, but only subjective estimate, then I would express the opinion that the youngest, probably already in the Christian Era, is El Sherano, and that Goomadeer is not much older, perhaps around the time of Christ. The differentiated complex from Wilton River probably represents a relatively older phase of settlement there.

The extent to which such an attempt to classify chronologically, using typology, may vary, is illustrated by the opinion of A. Gallus, expressed on the basis of my written information. A. Gallus considers that WR II and IIa, with heavy scrapers and a small number of points, may be the youngest, even subrecent, while ES may represent a substantially older phase (letter of 3/6/71). The classifica-

tion of Goomadeer is to a great extent dependent upon the occurrence of bladelets *(type 8.1)*, the concept of which differs between myself and the Autsralian authors (cf. C. White, 1967).

Again more complicated is the question of the dating of the macrolithic assemblages from WR XXII and the corresponding implements from WR II and IIa. Hoabinhian, which we may perhaps consider to be their typological basis, is often placed in the Mesolithic period (Boriskovskij, 1966b, van Heekeren, 1957). W. G. Solheim (1969) states that no Hoabinhian site in Indochina has so far been C-14 dated, though some data from the most recent excavations in Thailand have not yet been published.He believe that in that region it is possible to eliminate the mesolithic concept, and to consider Hoabinhian as two epochs: the early Hoabinhian — Upper Palaeolithic, middle and late Hoabinhian — early Neolithic. For late Hoabinhian he then gives two sets of date from a cave in south-west Thailand (excavated by C. Gorman) 8550 ± 200 B.P. (GaK-1846), 9180 ± 360 B.P. (GaK-1845). The new excavation in Cambodia, Laang Spean site, provides the earliest date of 6240 ± 70 B.P. MC-273), for layer 4, from which come uniface pebble tools together with some very rare pottery (Hoabinhian — Bacsonian) (Mourer, C. and R., 1970). On the whole these are industries of relatively high age.

The age of Australian pebble tools is apparently extremely varied, and their use continues to the present day (Mitchell, 1949). If we do not consider already the possibility of a Middle Palaeolithic chopper industry from Keilor Terraces near Melbourne (Gallus, 1970a, b), which cannot be considered for our comparison, we see that even in the small region of Clarence Valley, N.S.W., the pebble tradition appears in the Seelands rock-shelter (level I), even in 6445 ± 75 B.P. (V-27) and Whiteman Creek III (level VI), with uniface pebbles of Hoabinhian type together, of course, with blade tools, only 1640 ± 120 B.P. (GaK 372) (Mulvaney, 1969, McCarthy, 1967, McBryde, 1965).

Thus the temporal differentiation of these types is much greater than with point assemblages, while the striking Hoabinhian tradition continues right into the time around Christ. This, of course, gives us no basis for the dating of WR XXII, but I believe that with regard to typological composition (apart from ovates and the hand-axe, cleaver, horse-hoof) and on the assumption that this assemblage includes no blade-tools, we can place this macrolithic industry in the older phase of the development of Australian cultures, preceding the hafted-point technology. Even when some edge ground axes were evidently produced in this locality, the whole assemblage cannot be explained as a quarry site only.

On the question of the age of the contacts of the Australian continent with the cultural roots of South-East Asia, bearing chiefly upon the older phases of the Australian industries, the deduction of C. White (1971, 147) is significant, explaining the existence of a land bridge between Arnhem Land and New Guinea, about 640—800 km. wide, in the period of the oceanic regression during the youngest glacial (Würmian) stage, approximately from 28000 to 15000 years B.P. During this period, as probably during the preceding older glacial regression, the northern part of Australia was accessible over dry land, and open to both ethnical migration and cultural influence from the region of South-East Asia.

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BIBLIOGRAPHY

BARDON, L. J. et BOUYSSONIE, A., 1906: Outils écailles par percussion. — *Revue de l'Ecole d'Anthropologie 16, 170—175; Paris.*

BORDES, F., 1961: Typologie du Paléolithique ancien et moyen. I/II. — *Publ. Inst. Préhist. Univ. Bordeaux, Mém. 1; Bordeaux.*

BORISKOVSKIJ, P. I., 1966a: Basic Problems of the Prehistoric Archaeology of Vietnam. — *Asian Perspectives IX, 83—85; Honolulu.*

1966b: Pĕrvobytnoje prošloje Vietnama. — *Moskva.*

CAMPBELL, T. D., 1960: The Pirri — an interesting Australian Aboriginal implement. — *Records of the South Australian Museum XIII, No. 4, 509—524; Adelaide.*

CAMPBELL, T. D., NOONE, H. V. V., 1953: South Australian Microlithic Stone Implements. — *Records of the South Australian Museum VII, No, 3, 281—307; Adelaide.*

COOPER, H. M., 1954: Material Culture of Australian Aboriginals. — *Records of the South Australian Museum XI, No. 2, 91—103; Adelaide.*

1966: Archaeological Stone Implements from a Lagoon Bed, Kangaroo Islands, South Australia. — *Record of the South Australian Museum 15, No. 2, 309—327; Adelaide.*

DAVIDSON, D. S., McCARTHY, F. D., 1957: The Distribution and Chronology of some important Types of Stone Implements in Western Australia. — *Anthropos 52, 390—458; Freiburg.*

FLOOD, F. M., 1970: A Point Assemblage from the Northern Territory. — *Archaeology & Physical Anthropology in Oceania 5, No. 1, 27—52; Sydney.*

GALLUS, A., 1968: Excavation at Koonalda Cave, South Australia. — *Current Anthropology 9, No. 4, 324 to 325; Chicago.*

1970a: Expanding Horizons in Australian Pre-History. — *20th Century, Spring Issue, 1—8; Melbourne.*

1970b: The Geological Age of the Earliest Human Stone Tools uncovered during the Excavation of the Archaeological Society at Keilor, near Melbourne. — *Artefact, December 1970; Melbourne.*

GLOVER, I. C., 1969: The Use of Factor Analysis for the Discovery of Artefact Types. — *Mankind 7, No. 1, 36—51; Sydney.*

GOULD, R. A., 1970: Journey to Polykara. — *Natural History, December 1970, 56—67; New York.*

HALE, H. M., TINDALE, N. B., 1930: Notes on some Human Remains in the Lower Murray Valley, South Australia. — *Records of the South Australian Museum IV, No. 2, 145—281; Adelaide.*

HEEKEREN, H. R., VAN, 1957: The Stone Age of Indonesia. — *Verhandelingen van her Koninklijk Instituut voor Taal-, Land- en Volkenkunde XXI; 's-Gravenhage.*

HEEKEREN, H. R., VAN, KNUTH, C. E., 1967: Sai-Yok, Stone Age Settlements in the Kanchanaburi Province. — *Archaeological Excavations in Thailand, vol. I; Copenhagen.*

HEINZELIN de BRAUCOURT, J. de, 1960: Principes de diagnose numérique en typologie. — *Mém. Acad. R. Belgique des Sc., IIem série, XIV/6, 5—72; Bruxelles.*

HORNE, G. H., AISTON, G., 1924: Savage Life in Central Australia. — *London.*

JELÍNEK, J., 1979: Stone tool localities in Arnhem Land. — *Anthropologie XVII/2—3, 111—114; Brno.*

JONES, R., 1965: Archaeological Reconnaissance in Tasmania, Summer 1963/1964. — *Oceania XXXV, No. 3, 191 to 201; Sydney.*

MACINTOSH, N. W. G. (with Appendix by McCARTHY F. D.), 1951: Archaeology of Tandandjal Cave, South-West Arnhem Land. — *Oceania XXI, No. 3, 178—213; Sydney.*

MACINTOSH, N. W. G., SMITH, K. N., BAILEY, A. B., 1970: Lake Nitchie Skeleton-Unique Aboriginal Burial. — *Archaeology & Physical Anthropology in Oceania V, No. 2, 85—101; Sydney.*

MATTHEWS, J. M., 1966: A Review of the "Hoabinhian" in Indo-China. — *Asian Perspectives IX, 86—95; Honolulu.*

McBRYDE, I., 1965: Radio-Carbon Dates for Archaeological Sites in the Clarence Valley, Northern New South Wales. — *Oceania XXXV, No. 4, 260—266; Sydney.*

McCARTHY, F. D., 1964: The Archaeology of the Capertee Valley, New South Wales. — *Record of the Australian Museum 26, No. 6, 197—246; Sydney.*
1967a: Australian Aboriginal Stone Implements. — *Sydney.*
1967b: Australia: 1964—1966. — *Asian Perspectives X, 137—159; Honolulu.*

McCARTHY, F. D., SETZLER, F. M., 1960: The Archaeology in Arnhem Land. — In: Record of the American-Australian Scientific Expedition to Arnhem Land, *vol. 2, 215—295; Melbourne.*

MEGAW, J. V. S., 1966: The Excavation of an Aboriginal Rock-Shelter on Gymea Bay, Port Hacking, N.S.W. — *Archaeology & Physical Anthropology in Oceania I, No. 1, 23—50; Sydney.*
1966: Report on Excavations in the South Sydney District 1964—1965. — *Australian Institute of Aboriginal Studies Newsletter 2, No. 3, 4—15; Canberra.*
1967: Radiocarbon Dates from Curracurrang Cove, N.S.W. —*Australian Institute of Aboriginal Studies, Newsletter, 5, No. 5, 26—30; Canberra.*
1968: A Dated Culture Sequence for the South Sydney Region of New South Wales. — *Current Anthropology 9, No. 4, 325—329; Chicago.*

MICHA, F. J., 1965: Zur Geschichte der australischen Eingeborenen. — *Saeculum 16, 317—342; Freiburg i. Br.*

MITCHELL, S. R., 1949: Stone-Age Craftsmen. — *Melbourne.*

MOORE, D. R., 1970: Results of an Archaeological Survey of the Hunter River Valley, New South Wales, Australia. — *Records of the Australian Museum 28, No. 2, 25—64; Sydney.*

MOURER, D. and R., 1970: The Prehistoric Industry of Laang Spean, Province of Battambang, Cambodia. — *Archaeology & Physical Anthropology in Oceania V, No 2, 128—146; Sydney.*

MULVANEY, J. D., 1961: The Stone Age of Australia. — *Proceedings of the Prehistoric Society XXVII, 56—107; Cambridge.*
1966: The Prehistory of the Australian Aborigine. — *Scientific American, March 1966, 84—93;*
1969: The Prehistory of Australia. — *London.*

MULVANEY, J. D., JOYCE, E. B., 1965: Archaeological and Geomorphological Investigations on Mt. Moffatt Station, Queensland, Australia. — *Proceedings of the Prehistoric Society XXXI, 147—212; Cambridge.*

NIPPARD, A. P., MEGAW, J. V. S., 1966: Note on the Discovery of a Core of "Horsehoof" Type at Wattamolla, N.S.W. — *Mankind 6, No. 8, 359—362; Sydney.*

NOONE, H. V. V., 1943: Some Aboriginal Stone Implements of Western Australia. — *Records of the South Australian Museum VII, No. 3, 271—280; Adelaide.*

SAMPSON, C. G., 1970: The Smithfield Industrial Complex: Further Field Results. — *National Museum Bloemfontein, Mem. 5.*

SOLHEIM, W. G. II, 1969: Reworking Southeast Asian Prehistory. — *Paideuma XV, 125—139; Frankfurt.*

SONNEVILLE-BORDES, D. de, PERROT, J., 1954—1956: Lexique typologique du Paléolithique supérieur. Outillage lithique I—IX. — *Bull. Soc. Préhist. Française 51, 1954, 327—335, 52, 1955, 76—79, 53, 1956, 408—412, 547—559; Paris.*

STAPLETON, P. de S., 1945: Bifaced Stone Implements from South-Eastern South Australia. — *Records of the South Australian Museum VIII, No. 2, 281—287; Adelaide.*

TINDALE, N. B., 1937: Relationship of the Extinct Kangaroo Islands Culture with Cultures of Australia, Tasmania and Malaya. — *Records of the South Australian Musem VI, No. 1, 39—60; Adelaide.*
1949: Large Biface Implements from Mornington Island, Queensland, and from South Western Australia. — *Records of the South Australian Museum IX, No. 2, 157—166; Adelaide.*

TINDALE, N. B., MAEGRAITH, B. G., 1931: Traces of an Extinct Aboriginal Population on Kangaroo Island. — *Records of the South Australian Museum IV, No. 3, 275—289; Adelaide.*

WHITE, C., 1967a: Early Stone Axes in Arnhem Land. — *Antiquity XLI, 149—152; Cambridge.*
1967b: Plateau and Plain: Prehistoric Investigations in Arnhem Land. — *Unpublished Doctoral Thesis, Australian National University, Canberra.*
1971: Man and Environment in Northwest Arnhem Land. — In: D. J. Mulvaney, J. Golson: Aboriginal Man and Environment in Australia, *140—57; Canbera.*

WHITE, J. P., 1968: Fabricators, Outils écaillés or Scalar Cores? — *Mankind 6, No. 12, 658—667; Sydney.*
1969: Typologies for some Prehistoric Flaked Stone Artefacts of the Australian New Guinea Highlands. — *Archaeology & Physical Anthropology in Oceania IV, No. 1, 18—46; Sydney.*

WRIGHT, R. V. S. ed., 1971: Archaeology of the Gallus Site, Koonalda Cave. — *Australian Aboriginal Studies No 28; Canberra.*

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