Concept and method in lithic production during Lapita period in New Caledonia: a technological analysis

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Introduction

The objective of this paper is to present a qualitative analysis of the technical aspects of lithic production found at several sites in New Caledonia. Dates of 2500 or 3000 B. P have been obtained for numerous stone tools from four old sites suggesting that they were created at the same period or lapita time.

These sites are (Fig. 1):

- Podtanéan sites TON6 and TON7 (WPT054 and 055) at Naïa bay, near Paita, West coast, excavated by C. Smart in 1966 (Smart, 1966),

- Lapita site WKO Foué, Lapita Koné, West coast, material excavated by C. Sand in 1994 and 1995 (Sand, 1996 and Sand, this volume),

- Lapita site NKM001, Boirra, Koumac camping, excavated by D. Frimigacci and others (Frimigacci, 1978 and Callaque *et al.* 1981 ; Frimigacci and Maître, 1981),

- Podtanéan cave site NKM004, Koumac valley, Northern Territory, excavated by A-M Semah since 1992 (Sémah *et al.* 1995 and Sémah *et al.*, this volume).

A thorough quantitative inventory of the shard pieces and tools at these sites was previously carried out by a typological analysis and will not be the focus of this paper. However our aim is to identify how the supports were produced (Perlès, 1992). This paper is a general synthesis of technical information obtained for lithic pieces from western and northern New Caledonia.

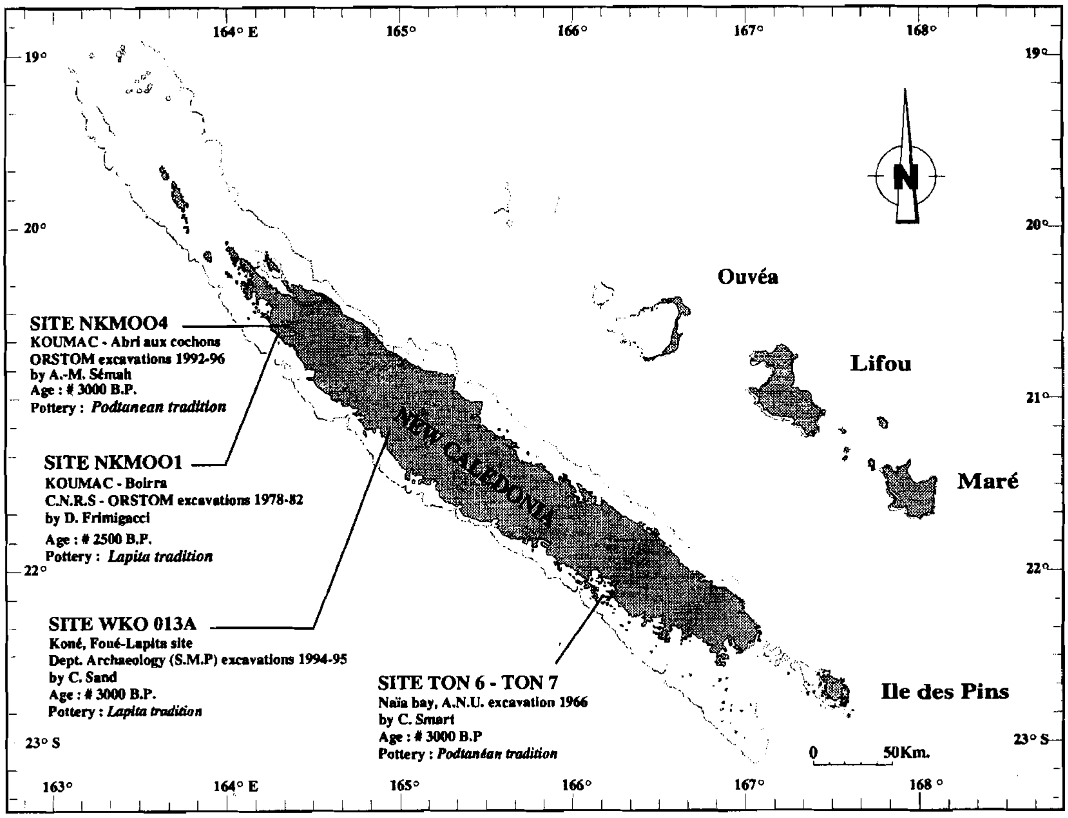


Figure 1
Map of New Caledonia showing sites investigated.

Methods

Analyses of artefacts was carried out using different techniques.

Firstly by a dynamic examination called "diacritique" (Dauvois, 1976) of the upper most surfaces of shards and cores. "Diacritique" examination may be defined as:

"an interpretative drawing of a core or a flake where the recognisable directions of scars (the negatives of previous removals) as well as their sequence of removal are represented by arrows and numbers" (Schlanger, 1994).

Secondly by an experimental approach which introduces an experimental model for the deciphering of archaeological pieces (Pelegrin, 1990 and 1991). This consists of reproducing core forms encountered in excavations and by observing the particularities of shards which have broken off. This type of approach permitted a greater understanding of the different types of support morphology used while chipping the material in a certain way.

For this purpose the cores are the most important artifacts in our analysis and by definition are created by fragment cutting according to a well structured set of technical criteria specific to the desired end product of the artisan. The cores volume carries the entirety of this structure and represents the best medium for identifying the system used for lithic production.

Archaeologicaly, in general in working stone, one group of humans has either a bidimensional concept of volume such as a table (2D) like in Levallois debitage in Europe or a tridimensional concept such as a cupboard as with the blade debitage (3D) or some others form of debitages (polyhedral...) (Boeda, 1990 and 1994). We therefore have a concept of volume which can be deciphered from the core form which is associated with a particular orientation of pieces removed.

The removal or chipping away appears to be therefore a production of the supports and primarily a way of shaping the volume and one volumetrical construction of the core.

Resultats of analysing cores and shards

Raw material, technique, mehod and concept used

In New Caledonia the raw material is a local chert which is called "phtanite". For exemple the cores were created either from sheets, blocks or large fragment of fissured chert wich is a phtanite of mediocre quality. In general the stone work with phtanite is very difficult because it contains an heterogeneous siliceous material inside a fissured and friable block (Forestier, 1996).

The technique which is the nature and type of material used in chipping: here in these sites the technique used is a stong hammer for un-direct percussion.

The method of chipping defined as the overall means of obtaining one or more objectives: tool supports, X Y or Z which will later be or not be transformed into tools (Tixier, 1978).

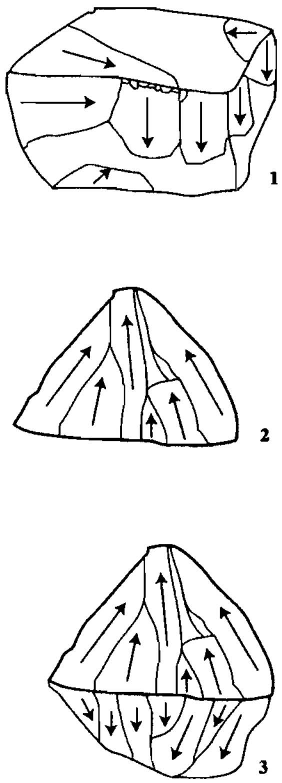
The concept: a core volumetric concept may be in 2 D or 3D.

There are two major groups of cores encountered on these sites (Fig. 2):
In the first group, we find polyhedral cores with successive orthogonal marks on the surface being cut where opportunism appears to be strong. This most often gives (in the best of cases), quadrangular forms or very rarely prismatic forms. The worst forms (most often encountered) are amorphous cores with numerous accidental cuttings where chipping off has ceased due to "step fractures" which suggests a simple method of orientation in certain pieces removed and the end of the debitage episode.
We encountered so many of these polyhedral core forms that there must be a large number of possible solutions to the way they were cut or to the way of working of the block.

With these core types, all forms may be produced with no particular predetermined volume configuration as is the case for the second group.

The second group of cores were grouped into types regarded as "discoid" cores. These are often encountered in archaeological excavations and exhibit a definite working phase whereby there are alternate chipping with or without a cortex in mind to obtain a stable, constant discoidal volumetric construction.

Figure 2
The different types of core encountered on these sites.



These cores were the prime focus of our attention. They were produced from sheets (15x9x6), quadrangular blocks, nodules or thick flakes. They possess conical or biconical forms. The repetition of these core forms with a particular volume will lead to a standardised repetition of the morpho-technological cutting characters and hence to types of flakes which are characteristic of stone workers in Oceania.

Based on the observations made of experimental replicas and technical lecture by "diacritique" examination on archaeological pieces we are able to show several of the technical criteria used for discoides and examine the consequences of a specific volumetric construction.

After the new technological investigations of Eric Boeda on the discoid concept in Europe (Boeda, 1993 and 1995) we recognised his six technical criteria for the conception of debitage of these four sites which prove that the discoid method had been used (Fig. 3 and 3bis):

1) The volumetric construction of cores is accomplished here with one volume and not one surface.

2) The particularities of this volume are either:

- a convex surface found on conical cores. These possess only one convex surface and an inferior surface or striking surface of a fragment, a natural surface or the surface of a diaclase,

- a biconvex surface found on biconical cores. This is constructed as its names suggests in two convex assymetrical surfaces. These two surfaces are delimited by a hinge: it is an intersection plane which joins the two convex parts. One is a striking surface (A) and the other is an opposite debitage surface (B). But their role may be reversed during the same construction sequence (A/B or B/A).

3) The fracture's surfaces of predetermined and predeterminants removals are at the intersection between two surfaces.

4) A cutting surface is developed to produce and condition a certain number of predetermined cuttings with a particular morpho-technique suited to the core volume.

5) The predetermined technical criteria consist of developing a peripheral convexity that will control the lateral and distal detachment of removal. That creates a phenomenon of "matrix" or "mould".

It requires an entire cutting of the core volume by alternating the striking surfaces. The striking surface represents a reversal of the upper most site of removal and more particularly the proximal zone (the cutting angle is close to 90°).

6) The percussion is a direct percussion with a strong hammer.

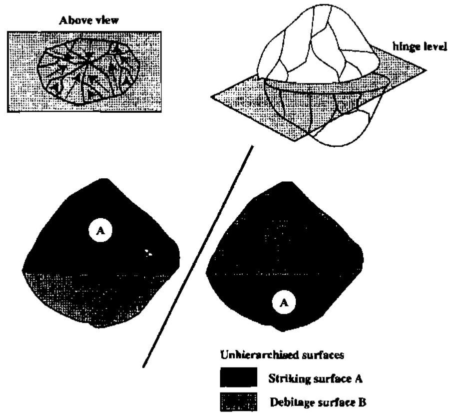


Figure 3 Some technical properties of discoid volumetric construction.

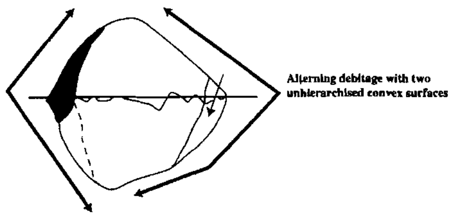
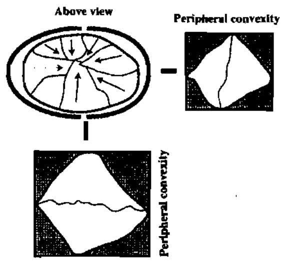


Figure 3 bis Technical propertie: the peripheral convexity in the discoid core construction.



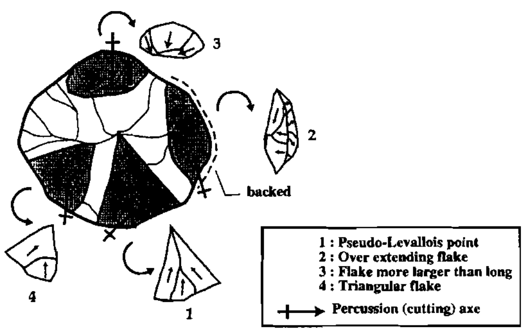


Figure 4 Experimental model: the four principal type of flakes obtained by the discoid method.

Technical consequences in the production of different fragment forms

It requires maintenance of the surfaces until the discoid mould is obtained. This may be conical or biconical in shape and contain an uninterrupted series of fragments which are more or less triangular and contain convergent lines on their uppermost surface. This requires no reworking of the striking platform like in the Levallois or blade debitage.

This recurrent and centripetal method is largely dependant on a set of technical criteria applied to the core volume. This method is energy efficient as the workable volume is cuttable and practically equivalent to the volume of the core.

The aspect of the flakes morphology is by nature pseudo-Levallois with pseudo-Levallois points. These flakes possess a shift in the cutting axis in relation to the morphological axis of the fragment.

The results of the experimental approach translated into an archaeological model of knapping (Fig. 4) shows four main forms of flakes (after Boeda, 1993):

- classic pseudo-Levallois points,
- triangular flakes with one to three convergent lines on their uppermost surface,
- flakes larger than they are long,
- over extending flakes: they are lateral fragments with a back determined by the intersection (the joint) between the two convex surfaces of the core.

In any debitage sequence or during the exploitation of the core, we can find these four types of flakes which confirm that the method used is really the discoid method because by definition they are the technical consequences of a specific volumetrical construction.

With this archaeological model as a tool for deciphering the archaeological flakes and understand their situation in the debitage episode, we have rediscovered these four flakes in New Caledonian sites assemblages associated with conical and biconical cores (Fig. 5 to 12).

Conclusion and technological implications

The major advantage of the discoid method is the use of nearly 100% of the initial core volume as is shown, for exemple, with the very small coresfound in site TON6 at Naïa Bay.

These cores will maintain the same volumetrical structure regardless of the advanced degree of cutting applied and will generate a product which is technically identical but metrically different.

The major inconvenient is the intersection of two convex surfaces which produces a large number of uniform flakes due to a certain rigidity of this matrix.

We have just seen a structured type of cutting which organises and imposes a set of physical, geometrical and technical criteria to a raw material in order to obtain a number of precise triangular fragments which will be used as they are or retouched in notches, scrapers...

This concept of volume offers an identical product which we also find in other cutting methods including European Levallois or perhaps Australian Levallois. This allows us to objectively infer that all cutting methods must not be restricted to one product (pseudo-Lavallois point for exemple) but focus on a large number of pieces which have been integrated by some technical system (Boeda, 1991 ; Geneste, 1991).

In the Western Pacific, it seems that discoid method exists also in the Salomon islands where it has been pointed out but not specifically described by two japanese archaeologists (Chikamori and Takasugi, 1985).

For the whole of the Lapita period, from the Papua New Guinea to the New Caledonian region, technical research directed towards studying the nature of techniques and methods of these "Flintknappers-navigators" will allow us to compare methods and the techniques used rather than only the flake tools.

Acknowledgements

I wish to thank my colleagues D. Frimigacci and C. Sand who provided the lithic collections of Boirra and Lapita-Koné for this work.

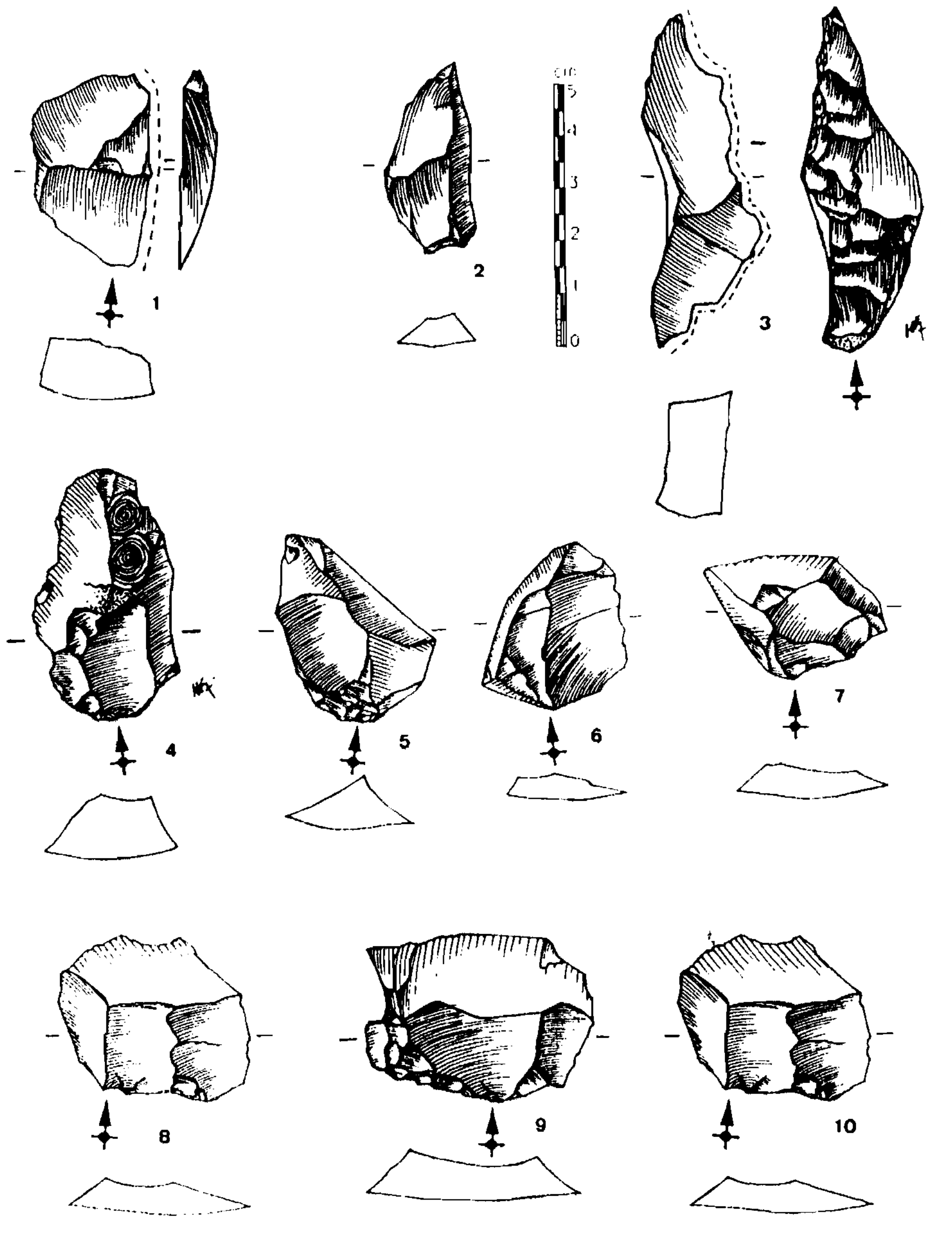


Figure 5
Lithic artifacts of Lapita site (WKO13A), typical discoid flake forms:
1-3: over extending flakes; 4: pseudo-Levallois point; 5-7: triangular flakes;
8-10: flakes larger than they are long.

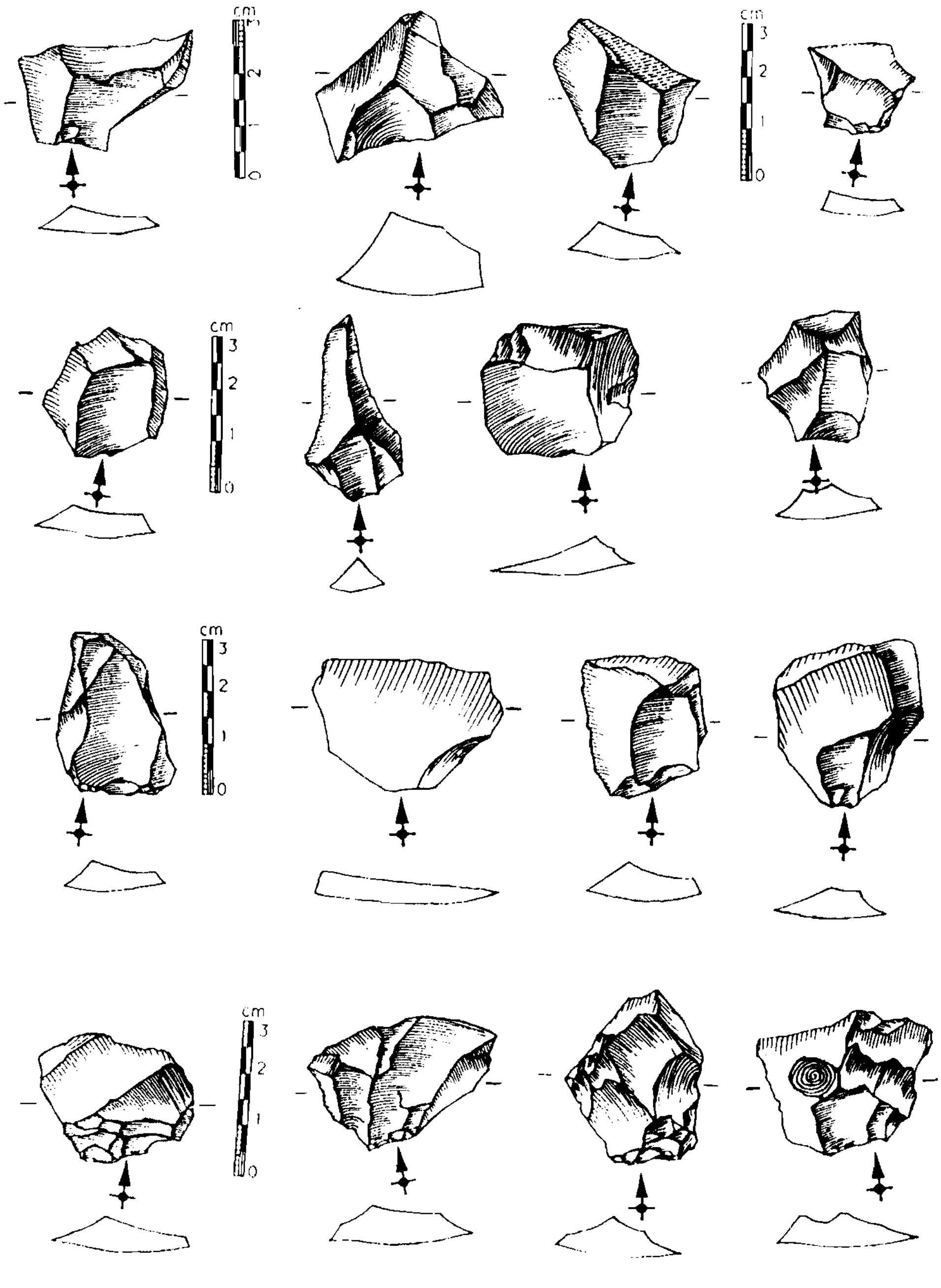


Figure 6
Lithic artifacts from Lapita site (WKO13A): typical discoid flakes.

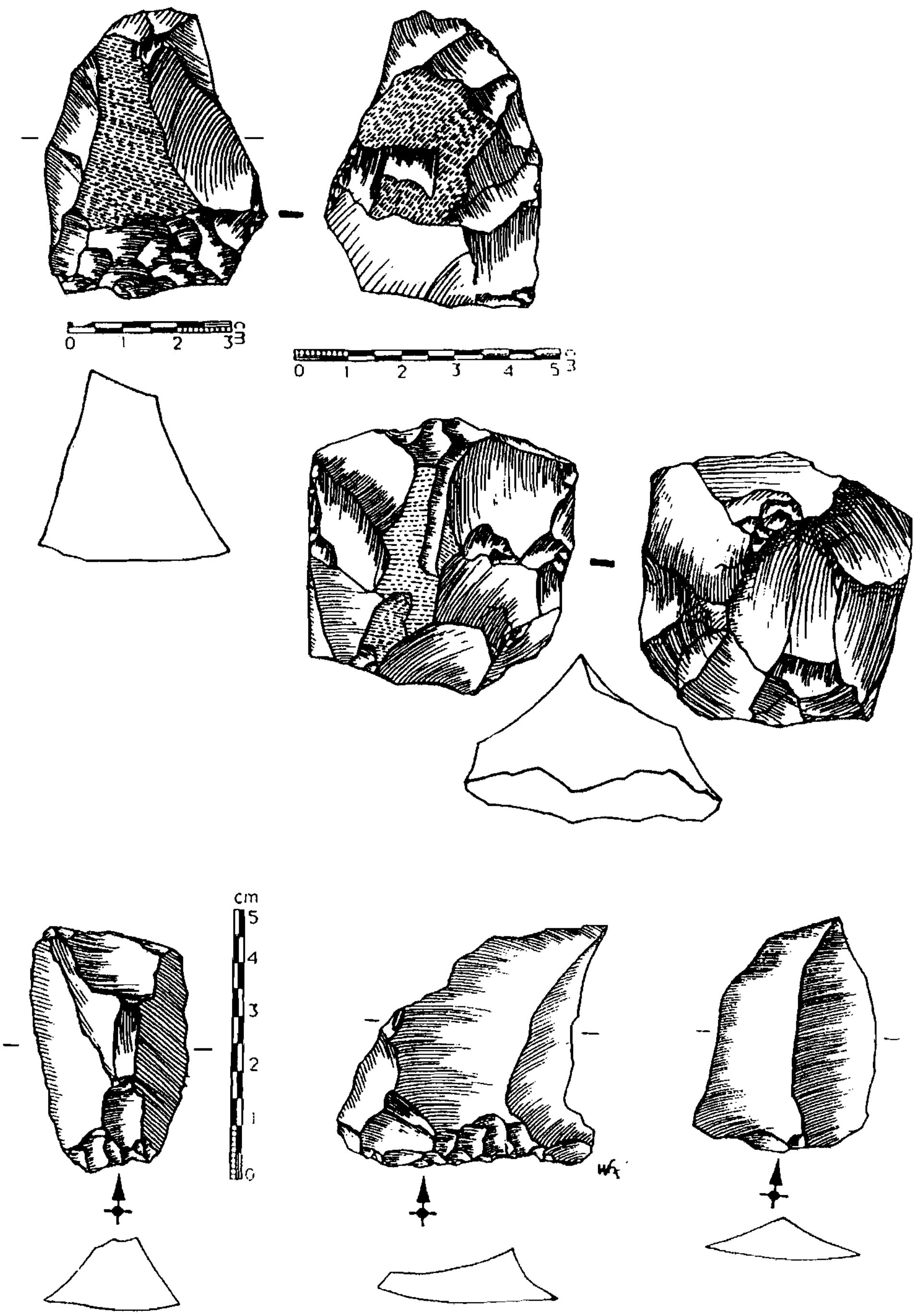


Figure 7
Lithic artifacts from Lapita site (WKO13A): discoid cores and flakes.

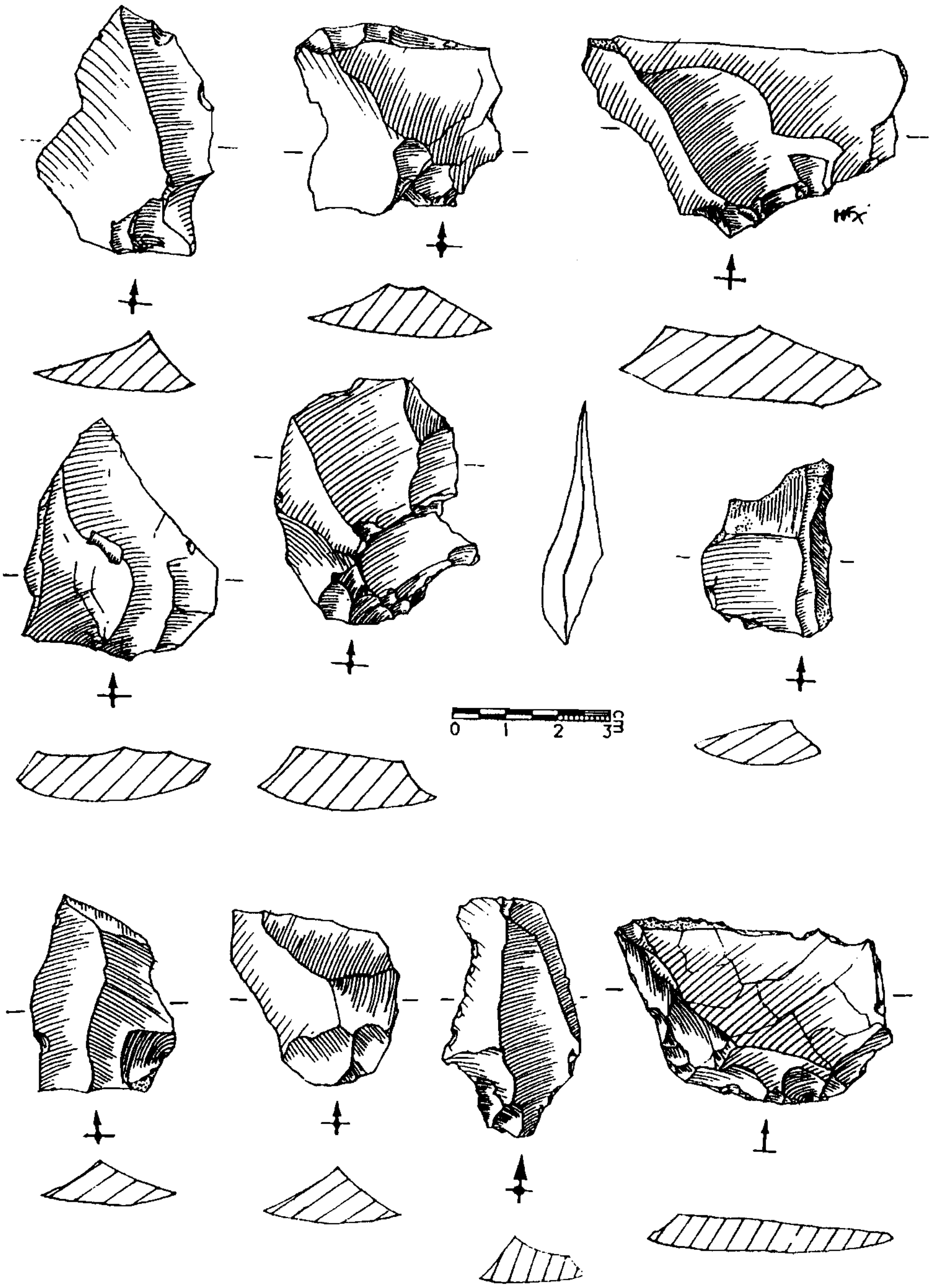


Figure 8
Lithic artifacts from Boirra site (NKM001): typical discoid flakes.

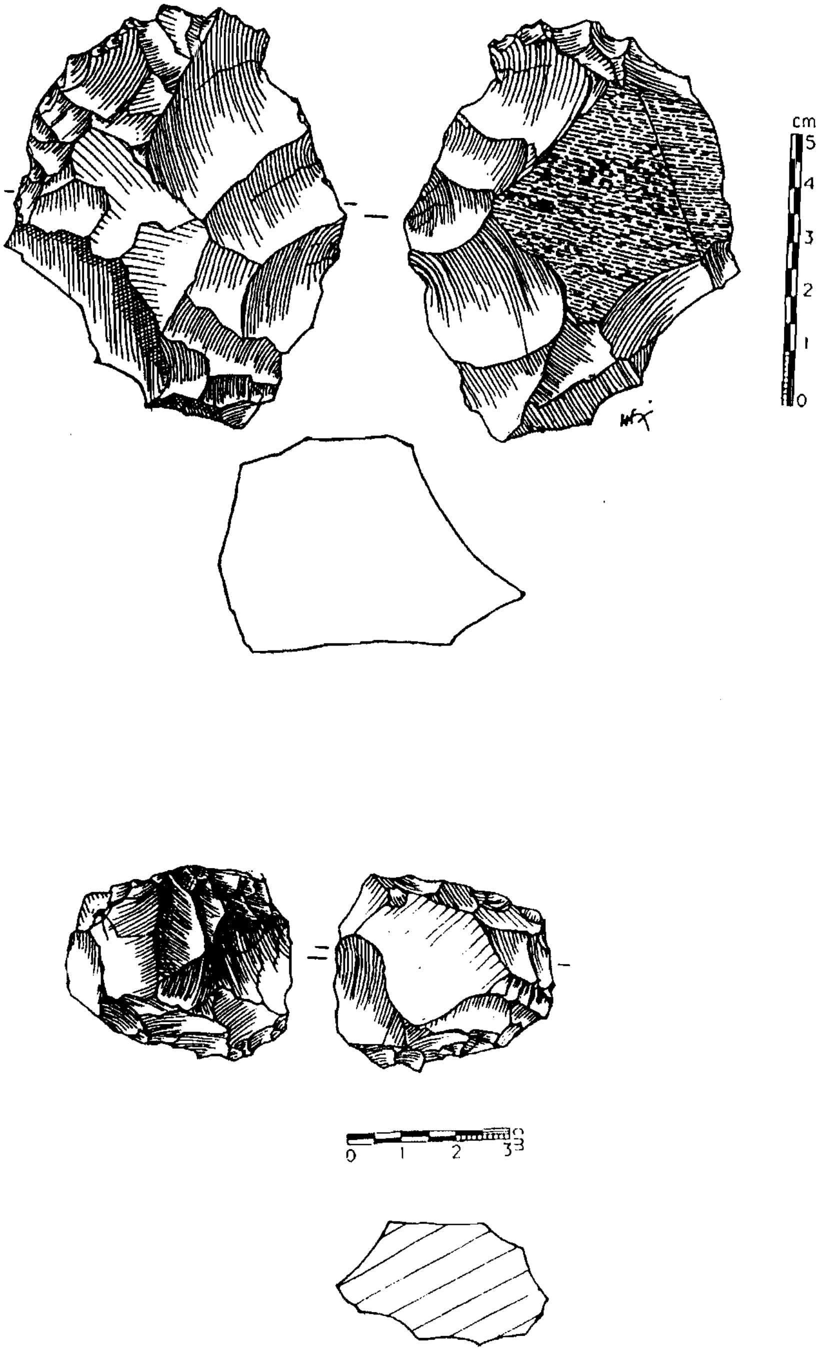


Figure 9
Lithic artifacts from Boirra site (NKM001): two discoid cores.

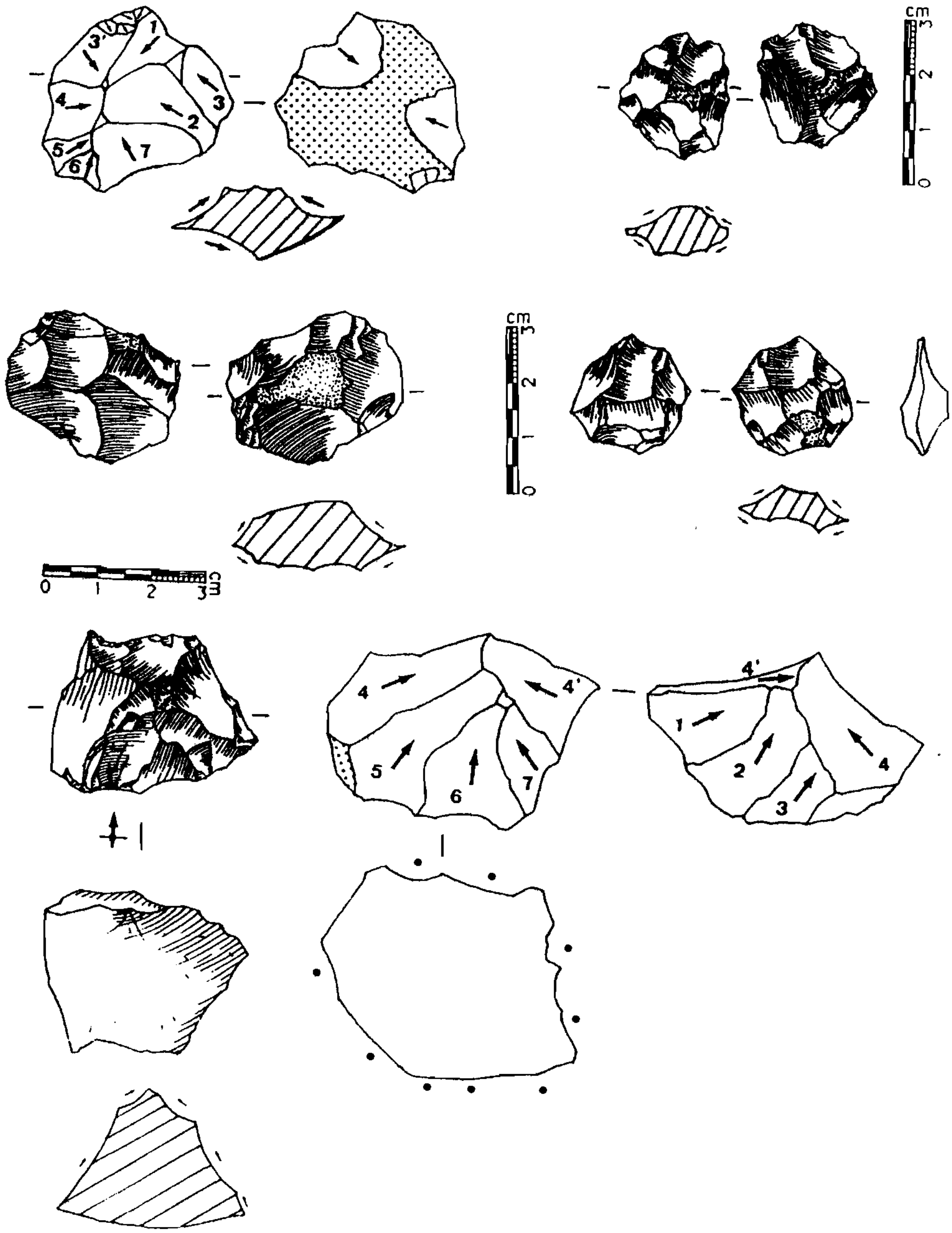


Figure 10
Lithic artifacts from TON6 site: typical discoid cores (with schéma diacritique showing discoid centripetal directions of percussion).

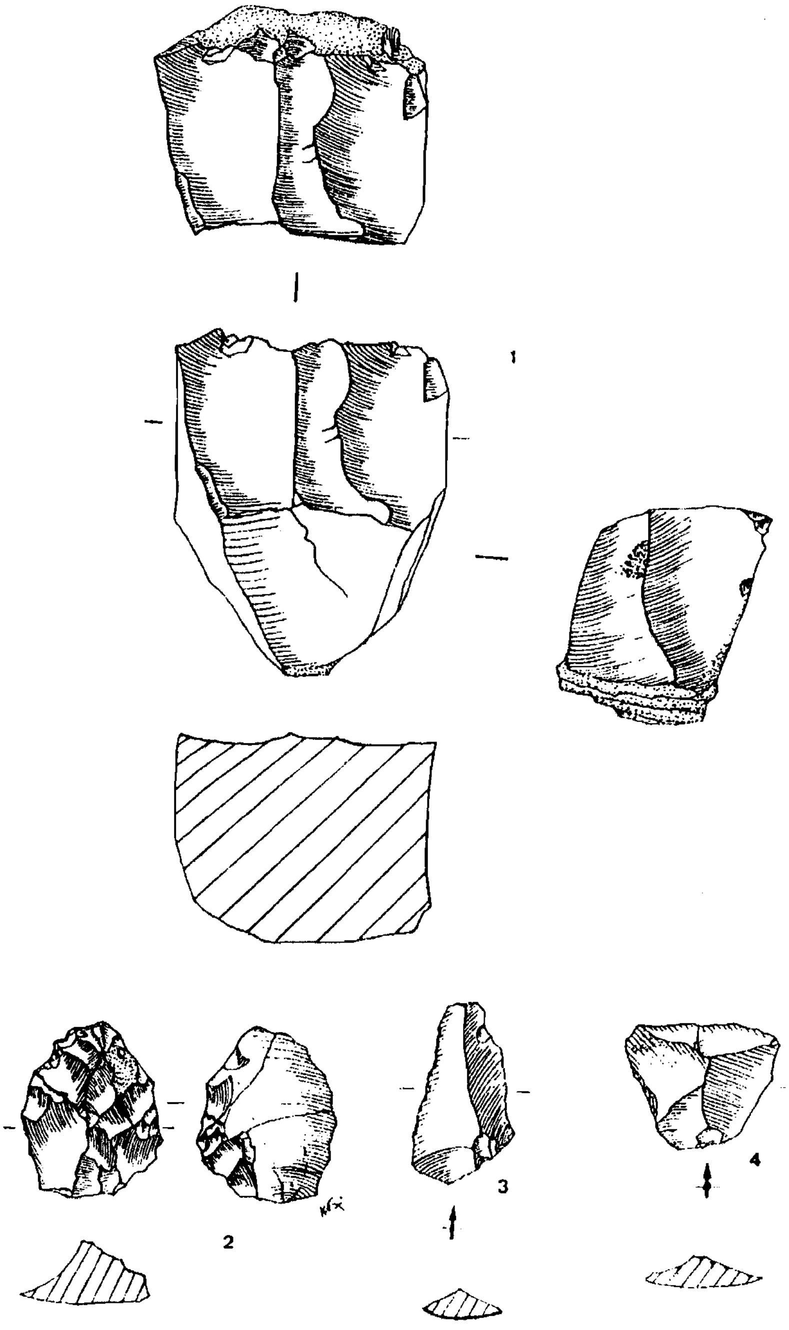


Figure 11
Lithic artifacts from TON6 site: 1: exemple of polyhedral core (alterning platform with angular sequences); 2-4: flake tools.

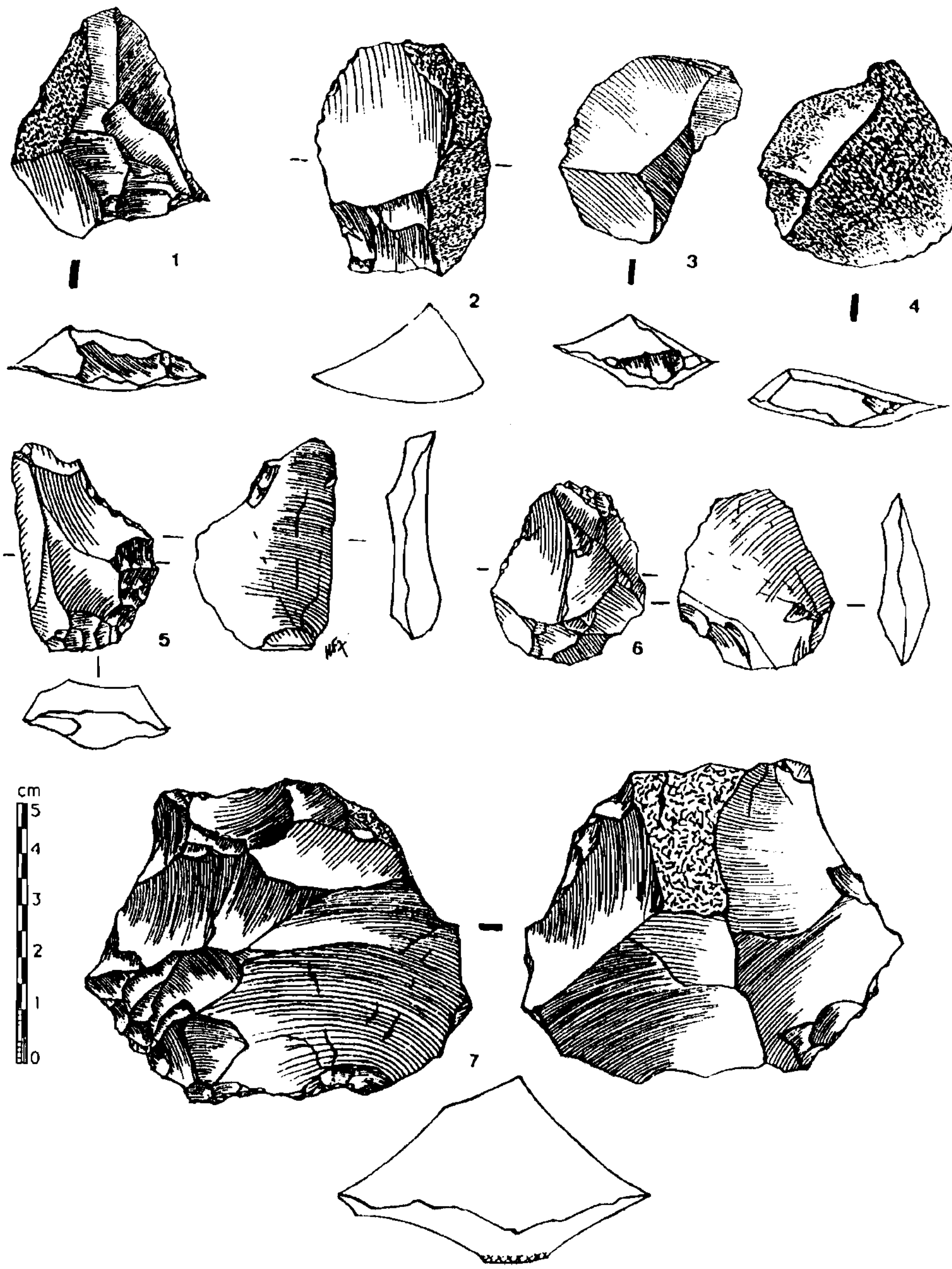


Figure 12
Lithic artifacts from NKM004 site: 1-6: typical discoid flake forms; 7: discoid core.

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