
Chert Procurement and Management during the Prehistory of Northern Israel

Christophe Delage



Electronic version

URL: <http://journals.openedition.org/bcrfj/5112>
ISSN: 2075-5287

Publisher

Centre de recherche français de Jérusalem

Printed version

Date of publication: 15 October 1997
Number of pages: 53-58

Electronic reference

Christophe Delage, « Chert Procurement and Management », *Bulletin du Centre de recherche français à Jérusalem* [Online], 1 | 1997, Online since 27 June 2008, connection on 05 May 2019. URL : <http://journals.openedition.org/bcrfj/5112>

CHERT PROCUREMENT AND MANAGEMENT DURING THE PREHISTORY OF NORTHERN ISRAEL

The last years have seen the development of provenance studies of archaeological remains present in prehistoric sites in the Near East. Materials such as ochre¹, basalt² and obsidian³ have been subject to detailed archaeometric characterization.

Concerning the chert⁴, it was known that it was occurring in abundance in northern Israel⁵. Some rare and limited studies have shown the potential of research on the origin and the knapping methods of prehistoric flint artifacts from the region⁶. Nonetheless, no systematic work has focused on seeking the

¹ Weinstein-Evron, M. and S. Ilani, 1994. "Provenance of Ochre in the Natufian Layers of el-Wad Cave, Mount Carmel, Israel". *Journal of Archaeological Science*, vol. 21, n° 4, pp. 461-467.

² Goren-Inbar, N., I. Perlman and A. Heimann, 1986. "Chemical Mapping of Basalt Flows at Paleolithic Sites". *Archaeometry*, vol. 28, part 1, pp. 89-99.

Weinstein-Evron, M., B. Lang, S. Ilani, G. Steinitz and D. Kaufman, 1995. "K/Ar Dating as a Means of Sourcing Levantine Epipalaeolithic Basalt Implements". *Archaeometry*, vol. 37, part 1, pp. 37-40.

³ Cauvin, M.-C., 1991. "L'obsidienne au Levant préhistorique : provenance et fonction". *Cahiers de l'Euphrate*, 5-6, pp. 163-190. Paris : Editions Recherche sur les Civilisations, ADPF.

Williams-Thorpe, O., 1995. "Obsidian in the Mediterranean and the Near East: A Provenancing Success Story". *Archaeometry*, vol. 37, part 2, pp. 217-248.

⁴ I don't make any distinctive use of the terms chert and flint. So they will be considered as synonymous in this paper.

⁵ Bar Yosef, O., 1991. "Raw Material Exploitation in the Levantine Epi-Paleolithic". In A. Montet-White and S. Holen (eds.), *Raw Material Economies among Hunter-Gatherers*, pp. 235-250. Lawrence, KS: Department of Anthropology, University of Kansas. (Publications in Anthropology 19).

⁶ Frachtenberg, F. and J. Yellin, 1992. "Preliminary Study of Flint Sources in Israel by Neutron Activation Analysis". In M. Waelkens, N. Herz and L. Moens (eds.), *Ancient Stones: Quarrying, Trade and Provenance. Interdisciplinary Studies on Stones and Stone Technology in Europe and Near East from the Prehistoric to the Early Christian*

sources of the materials used on a site nor the implications of this on the specific relationship between prehistoric humans and nature.

It is in this general context that I began and elaborated upon, in 1993⁷, a diachronic study concerning the questions of procurement and management of the siliceous raw materials from the Mousterian to the Natufian (250,000/200,000 - 10,300BP) in northern Israel (Galilee). My current study focuses on two sites: Hayonim, located on the sea-facing slope in western Galilee, and Eynan (Ain Mallaha), located on the eastern slope of the Galilee.

This project focuses on two facets. One facet emphasizes a naturalistic orientation with a focus on the mineral environment. The other facet is archaeologically oriented and attempts to shed light on human behaviors. On the one hand, these two facets are distinguishable because they represent two different realities, based on different scopes of investigation. On the other hand, they are very complementary, especially when one stands at the viewpoint of the human and society, because prehistoric populations have lived, exploited and adapted themselves to their natural environment.

This paper wishes to summarize these years of research, to bear witness to an important fieldwork, and to yield a detailed analysis of the geological and archaeological cherts.

The chert resources in Galilee

Regional availability in cherts

Methodology

It seemed to me from the beginning that it was important to go beyond the study of provenance of the archaeological artifacts. One of my goals is to document choices in the selection of the materials. In order to do this, the chert environment had to be studied as completely as possible. A detailed and systematic work of mapping and surveys was conducted between 1993 and 1995 for the Hayonim area and in 1996 for the Eynan area. The aims were to define the chert-bearing geological formations, to visit and describe the outcrops, and to take chert samples as representative as possible of the visual (color, texture, etc...) variability of the materials present in each location, according to their geological layer, their depositional context, and so on...

Period, pp. 149-154. Leuven: Leuven University Press. (Katholieke Universiteit Leuven, Acta Archaeologica Lovaniensia Monographiae 4).

⁷ Delage, C., 1993. "Recherches préliminaires sur les sources de matières premières lithiques en Galilée occidentale (Israël)". *Orient-Express*, 1993/2, pp. 27-29.

Finally, the geological chert samples were brought together in a reference collection (lithotheca), curated at the Centre de Recherche Français de Jerusalem.

Results

Based on this methodology, the comparison of these two regions of the Galilee can shed light on their characteristics and specifications. The topographical context of the regions surrounding the two sites has greatly influenced the forms of raw materials available in each region. In western Galilee (Hayonim region) the inventory revealed that the abundance and diversity of cherts (fig. 1) within the six geological formations found in this region are almost exclusively *in situ*. Topographically this region exhibits minimal altitude differences. Because of this, the rivers here are intermittent and play a secondary role in the mechanical weathering and movement of lithic materials and sediments; therefore, occurrence of chert nodules is very sparse in secondary contexts such as conglomerates and sediments in the river beds and the coastal plain.

Conversely the eastern Galilee, with its slope facing toward the Huleh basin (Eynan area), shows very different features. This region, which is part of the active tectonic complex of the Rift Valley, exhibits great height differences over short distances. Of the three chert-bearing geological formations found here, two are relatively close to Eynan, found low on the slope of the adjacent hill. The third is found higher up and slightly west of the site. The rivers in this region transport the cherts from further outcrops thus making them available in secondary context at the bottom of the slope. These nodules can be found as cobbles with dimensions suitable for flintknapping.

The Flint Materials

The next step of the study consisted in describing the collected flint samples. I chose a pluridisciplinary (visual and geochemical) approach which enabled the cross testing and validation of the individual techniques in order to assure better reliability in the results.

2a. Macroscopic Observation

Methodology

Concerning the macroscopic observation, features such as cortex, color, texture, inclusions, etc. have been described for each of the flint samples, and subsequently ranked in order to document the prevailing features or associations

of features⁸. This procedure was followed with the aim of creating raw material types. With the explicit goal of precisising the source of the materials, this classification seeks to assess whether or not the defined types are characteristic of one or more formations with either a limited or a widespread geographical distribution.

Results

A first, preliminary step aims at shedding light on the “*geological fingerprints*” of the chert; that is, the types which characterize a single formation. This procedure has been very positive and proves the efficiency of the visual observation in defining and differentiating lithic materials, at least in this region. Nevertheless, it only gives a very large geographical definition of the sources, corresponding to the area where the formation is potentially outcropping. For a better evaluation of the chert provenances, it will be necessary to identify local facies within these main formations.

However, my study allows for the raising up of certain cherts to the level of “*lithological fingerprints*”, those which have a limited enough geographical distribution within a single formation. A notable example of this is the eocene chert with the nummulites which has been found only at the spring of the Nahal Dishon in eastern Galilee.

2b. Geochemical Analysis

The geochemical characterization of the cherts has been done in collaboration with Dr. Y. Nathan, geochemist of the Israel Geological Survey. All of the chert bearing geological formations from the Hayonim region have been analyzed. In sum, ca. 70 samples now have a signature in trace elements, obtained by ICP-AES and then by ICP-MS⁹. The same procedure as used for the macroscopic analysis has been applied here. That is, a comparison of the trace element ratios has been conducted and each formation has been distinguished from each other by a ranking of the results. Some elements, such as barium and strontium, are very good indicators. Still, many complementary analyses would be necessary in order to document specific locations within each formation.

⁸ Luedtke, B. E., 1979. “The identification of sources of chert artifacts”, *American Antiquity*, vol. 44, n° 4, pp. 744-756.

⁹ ICP-AES: Inductively Coupled Plasma Atomic Emission Spectrometry/ICP-MS: Inductively Coupled Plasma Mass Spectrometry. For the detail of the method, cf. S.J.B. Reed, 1990. “Recent developments in Geochemical Micro-analysis”, *Chemical Geology*, vol. 83, pp. 1-9.

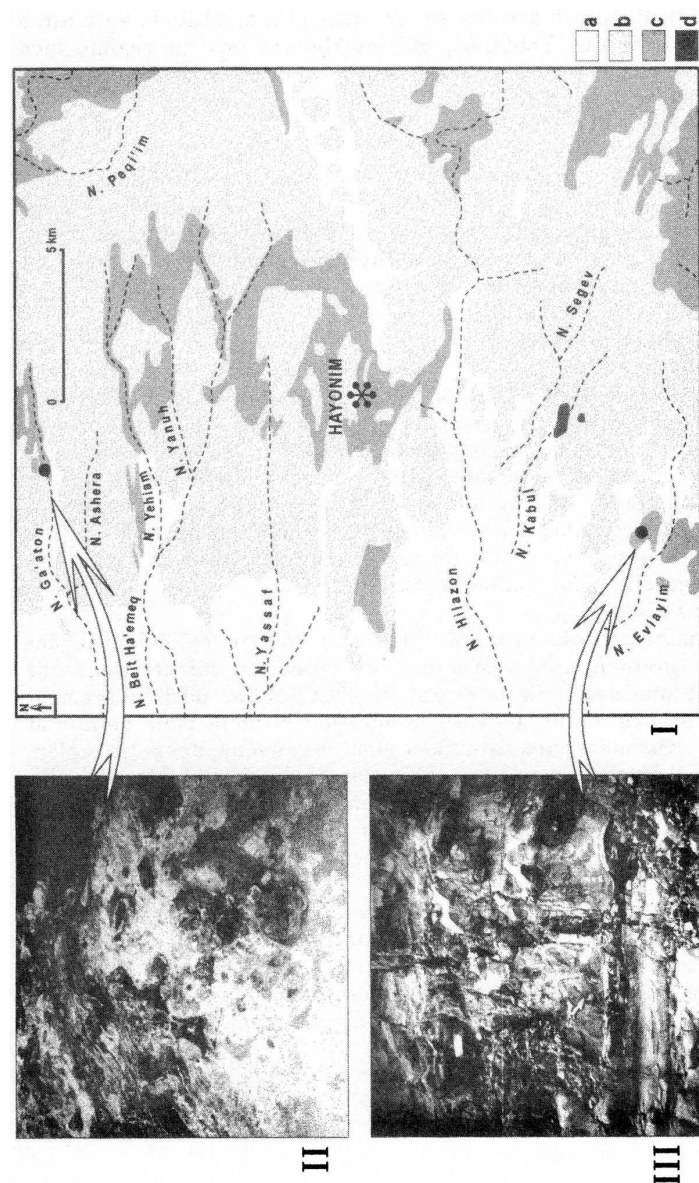


Fig. 1: The chert sin their geological concept, Hayonim region.

I. Map of the potential zones of outcrops (a- Cherts in secondary position; b- In situ sedimentary formations with few or no cherts; c- Chert-bearing formations; d- Basalt formations).

II. Upper Cenomanian (Deir Hanna formation) chert nodules in the Nahal Ga'aton.

III. Lower Eocene (Zor'a formation) chert lenses near Nahal Evlayim.

The different results obtained are reliable and validate the principles and the potential of this method for future research.

Chert Procurement and Exploitation: Preliminary Archaeological Data

Procedure

Nature of the Samples

This evaluation of the chert availability in northern Israel makes sense when it is integrated in pluridisciplinary research programs on several prehistoric sites within a region. As mentioned above, the sites of Hayonim and Eynan are currently of concern here. Specifically, the Mousterian and Natufian levels from Hayonim Cave, and the Natufian levels from the Hayonim Terrace; as well as the Natufian levels from Eynan are being studied at present.

Method

Observation of the archaeological material from the different sites and layers is based on the same descriptive criteria as those used for the study of the geological cherts. The lithic products present on these sites are described and then grouped according to raw material categories, and finally an inventory is listed. A comparison with the geological material from the lithotheca allows for identification according to geological formation. The study of the cortex of the material (when present) helps to determine if the material was found in primary or secondary context at the time of its procurement, thus informing more precisely on its location. Finally, an estimation of the area of potential provenance can be proposed.

Data Analysis

The study of the material from Hayonim already opens up some interesting prospects. Notable diachronic differences are revealed in the lithic material selection and exploitation.

The Mousterian horizon presents an important variety of materials brought to the site, but it is dominated by a few major types: eocene and cenomanian. I have also identified some rare pieces made from an exogene flint (nummulitic type) which originates 30 kilometers (18 miles) eastward.

The Early Natufian in the cave brings some surprise. Fewer types of raw materials seem to be present in this horizon. Interestingly, the eocene flint, which is found close to the site and reveals good qualities for flintknapping, is present in a very low quantity. Rather, the cenomanian materials and a red flint represent the majority of pieces recovered, yet the exogene flint was also present in the Early Natufian from Hayonim Cave.

Finally, the Late Natufian from the terrace presents again a heterogeneity in the exploited raw materials, with a clear preference for the eocene and cenomanian types.

In sum, the study of the geological potential of the cherts around Hayonim has listed an inventory of types much richer than the one present on the site, no matter which layer is considered. It seems then, that the prehistoric populations have made a selection within this environment where chert is abundant and varied. Still, some of the materials brought to the site are currently of unknown source. One of them is the red flint. It is possible that the other one originates in the Mount Carmel region, lying to the southeast.

These few results allow for a different approach to the study of the lithic industry in terms of raw material procurement and exploitation.

To begin with, this study finds its solid basis in the detailed geological and geographical evaluation of the regional availability of cherts. All of the raw material types present on the studied sites have been identified visually and subsequently described and inventoried. Among them the majority benefit as well from a geological definition and a geographical origin, even though some rare categories are still unknown. It is now appropriate to concentrate the attention on these types in order to find their source, local or more distant.

Independently from questions of provenance, the raw material must now be connected with the technological and typological dimensions of the products present in the sites. This approach must be applied as it relates to other prospects of activities and behaviors at the scale of the site, exclusive of the surrounding environment. On the techno-economic level, for instance, the expedient nature of the Natufian lithic industry¹⁰ can be questioned again. The state of the material has been interpreted as a response to a lack of flint in the immediate environment around the sites in the Galilee. It seems clear now that the Natufian populations have not only taken advantage of an environment rich in flint, but they also were selective of the raw materials they exploited.

The problem remains open; thus one can draw upon interesting paleoethnological prospects. In one way, the movement of the raw materials and the distances traveled can shed light on several issues including procurement modes of prehistoric populations, the definition of possible “territories” and the exploitation strategies used, and the hypothesis of a socialized environment. Additionally, the materials introduced to the site can give indications of possible differential treatments of the raw materials, and

¹⁰ Irregular cores or with one striking platform, low preparation in the core shaping and flake striking, all tools – excepting the lunates – non-stereotypical, short use of products.

raise some interpretation issues in terms of social organization, labor division, or even representations of the techniques¹¹.

Christophe DELAGE
(Translation: C. and K. Delage)

¹¹ I am particularly pleased to mention the different institutions and individuals that helped and encouraged me in this work: Irene Levi-Sala Care Archaeological Foundation (London), the Centre de recherche français de Jérusalem and the French Ministry of Foreign Affairs, and the Geological Survey of Israel; O. Bar Yosef, A. Bein, F. Blanchetière, D. Bourel, S. Ilani, H. Khalaily, L. Meignen, Y. Nathan, B. Porée, J.D. Speth, K.C. Sullivan, F. Valla, B. Vandermeersch.

I would like as well to thank C. Commenge (CNRS, Jerusalem) for her careful reading and comments on a first draft of this paper.