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Lia Karimali

Designing a 3-layered data base for modelling lithic distribution: The example of the Aegean

ABSTRACT

Recent trends in distribution modelling of lithic material call out for the need of comparing inter-site procurement and production strategies at micro-regional and micro-temporal scales, taking into account the local peculiarities of physical topography (i.e., geo-morphological relief, proximity to water etc.). This demands the handling of a large amount of lithic data, to be analysed in a regionally scaled, comparative framework. A relational, 3-layered database was designed for facilitating the management of a potentially expanding regional corpus of lithic data. By combining site-contextual and object-contextual information, as well as technologically-oriented object description (based on the principles of the 'chaine operatoire' approach), the data base aims at providing a dynamic interface for testing future models of lithic distribution. The data base is also planned to constitute the input of a Geographical Information System, taking into account the geo-morphological characteristics of the region of interest.

MODELLING LITHIC DISTRIBUTION IN THE AEGEAN: AN INTRA-REGIONAL APPROACH

Identification of the mechanisms by which lithics were distributed over an area in prehistory is a critical question, lying at the heart of any lithic analysis. Within the tradition opened by Renfrew and his colleagues in the 1960's (Renfrew *et al* 1965), measurement of the spatial distribution of materials is mainly pursued by 'fall-off' analyses. Fall-off studies use mainly quantitative variables (i.e., material abundance, as measured by the number or the relative frequency of a material within an assemblage) to identify regular patterns of spatial distribution linked to specific mechanisms of exchange (down-the-line, middlemen trading, central distribution etc.; Renfrew 1975). A corollary target of such studies is the distinction of regions in contact and supply zones, on the basis of material abundance.

An ongoing debate develops over the years concerning the nature of the variables to be measured, as well as the validity of the exchange patterns assumed in fall-off studies. Obviously, interregional comparisons based on quantitative variables only (i.e., material abundance in absolute or

relative terms) do not take into account differential conditions of site recovery and preservation. Thus, special attention is placed on *what is to be measured*. It is proposed that regional comparisons should rely on

- qualitative variables, such as the stage by which the material is introduced to the site ('stage of material importation'), as well as on
- relational variables, comparing the management (i.e., the type of blanks and tools produced) of the raw materials concurrently used within the same site.

Such variables should be correlated to the proximity of a site to the main routes of communication (coast, river mouths, land meeting points) along which the material circulates and the site topographic context, and not the geographic distance of a site from the source (calculated in km; Karimali 2000 & in press).

In the Aegean (Fig.1), interregional analysis of assemblages dated from the LN/FN period (Perlès 1990) has shown that obsidian distribution patterns change in relation to regional parameters. Zones situated closer to Melos, from Cyclades to central Greece (the 'contact zone'), entered obsidian in various forms (raw nodules, processed cores or ready blades), whereas zones lying over 300 km away from the source '(supply zone') entered obsidian in an already processed form. A rather refined re-examination of obsidian distribution patterns in the same region (i.e., site and time specific) (Karimali 2000; Fig. 2) shows that differences in stage of importation are in direct relation to site topography (coast/inland) or site geomorphology (cave/hilly/plain site). Generally, the more distant from the coast or the lowlands a site is, the more likely to have procured obsidian in the later stages of reduction.

Figure 1.

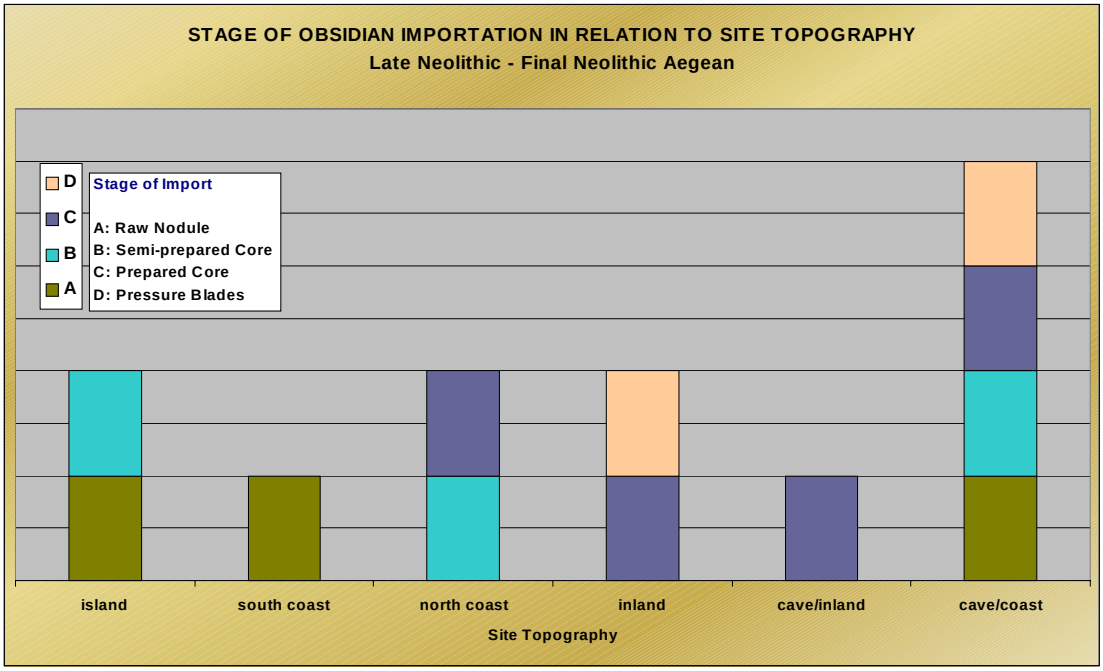

Figure 2

DESIGNING A SITE-CONTEXTUAL DATA BASE

The foregoing observations urge us to examine the relationships developed between a rich set of lithic variables and their macro and micro-locales. This is a rather context-oriented perspective, in which procurement, production and use strategies are assessed against the topographic relief of the site in which they were found. The linkage between lithic data and site surroundings requires the handling of a potentially expanding regional corpus of lithic data that will imprint the artifact's technological and use history within its regional context.

To satisfy these needs, a three-layered data base was designed, as a dynamic interface for assessing the linkages between lithic and site variables in a number of cases and for testing models of lithic distribution in the Aegean. The relational database was created for hosting all the necessary archaeological and environmental information, allowing an easy retrieval of the data and the interface with GIS digital cartographic material (Fig. 3).

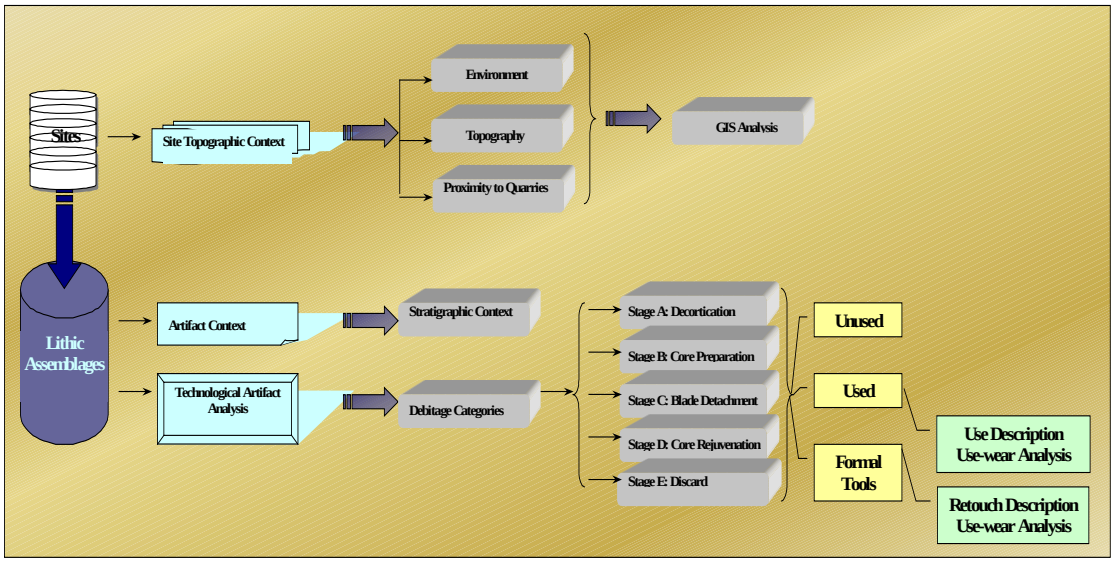

Figure 3

The first layer, containing site-contextual information is planned to store all available topographic and geo-morphological site features, such as elevation, aspect, slope, vegetation, proximity to water and material resources, proximity to coast, river mouths or other topographic features that may have played a role in affecting site access to the existing routes of communication. The same layer is also planned to constitute the input of a future GIS analysis aiming towards the examination of the relation of

lithic strategies to features of the topographic relief in selected geographical zones (i.e., proximity to the coast and rivers, proximity to local sources, topographic settings, etc.). The second and third layers pay attention to the artifact itself. The former layer contains information regarding the stratigraphic context of the lithic artifact. It aims at assessing its location in relation to the architectural and the movable finds of the site.

The third layer registers the technological and use history of the artifact. In designing the overall structure of the information in this layer the method of 'chaine operatoire' is employed. Virtually, in every lithic assemblage all artifacts are products and by-products of a reconstructed chain of technical actions ('chaine operatoire') composed by some basic, successive technical steps (Pelegrin 1990). Consequently, artifact classification is primarily structured on the basis of the technical sequence encountered in the Aegean. In the main data table, artifacts breakdown in five main technical categories, corresponding to the main stages of the Aegean blade and flake sequences (Stages A-E; Fig. 4). Selection of each of these stage categories signals the appearance of a selected number of fields, pertaining to the techno-morphological attributes (i.e., size, technique, blank type, morphology etc.) of the artifacts produced by this stage (Fig. 5). It is only after this point that information on use is collected on the basis of the absence/presence of edge modification. Used artifacts are divided into formal tools (bearing deliberate retouch) and '*a posteriori*' tools (bearing only usage scars). Tool registration includes both macroscopic and microscopic information on retouch and use attributes (i.e., location, extent, distribution and morphology of retouch scars, polish and striations accordingly). Each of the aforementioned data base forms is supplemented with notes, object photos and drawings as well as bibliographic sources.

With the aforementioned schema of registration, the artificial classification of artifacts into debitage and tool categories is avoided from the outset, and the life history of the artifact unit is examined and reconstructed in its integrity. Registration of artifacts as debitage products and by-products of a chain of technical actions leads to the reconstruction of the whole reduction sequence in which they belong. During the analysis, the questions addressed are both quantitative and qualitative. Quantitative queries provide a clue over the absolute and the relative representation of a material or a particular stage of the reduction sequence (i.e., preparation) on the site. Qualitative queries refer to information regarding the stage in which the material entered the site, the types of techniques or errors linked to its processing, or the selection strategies

pertaining to its management (i.e., deliberate selection of blanks of particular size to form specific tool categories). Additional information is provided with regard to questions of blade standardisation, as well as the relation between tool and use-wear morphology. Reconstruction of each of the reduction sequences present on a site leads to successful intra- and inter-regional comparisons and provides valuable insights into diachronic modes of lithic distribution and management in the Aegean.

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Raw Nodule
A
B
a1
a2
a3
Semi-Prepared Core
Cortical Flakes
Tools
C
b1
b2
Pressure Core
Crested Blade
Cortical Blade
Tools
D
c1
c2
Pressure Core
Pressure Blades
Tools
E
d1
d2
Core Debris
Tablet
Rejuvenation Blade/Flake
Tools
Figure 4: The Blade Reduction Sequence:
Cores, Debitage & Tools

Figure 4

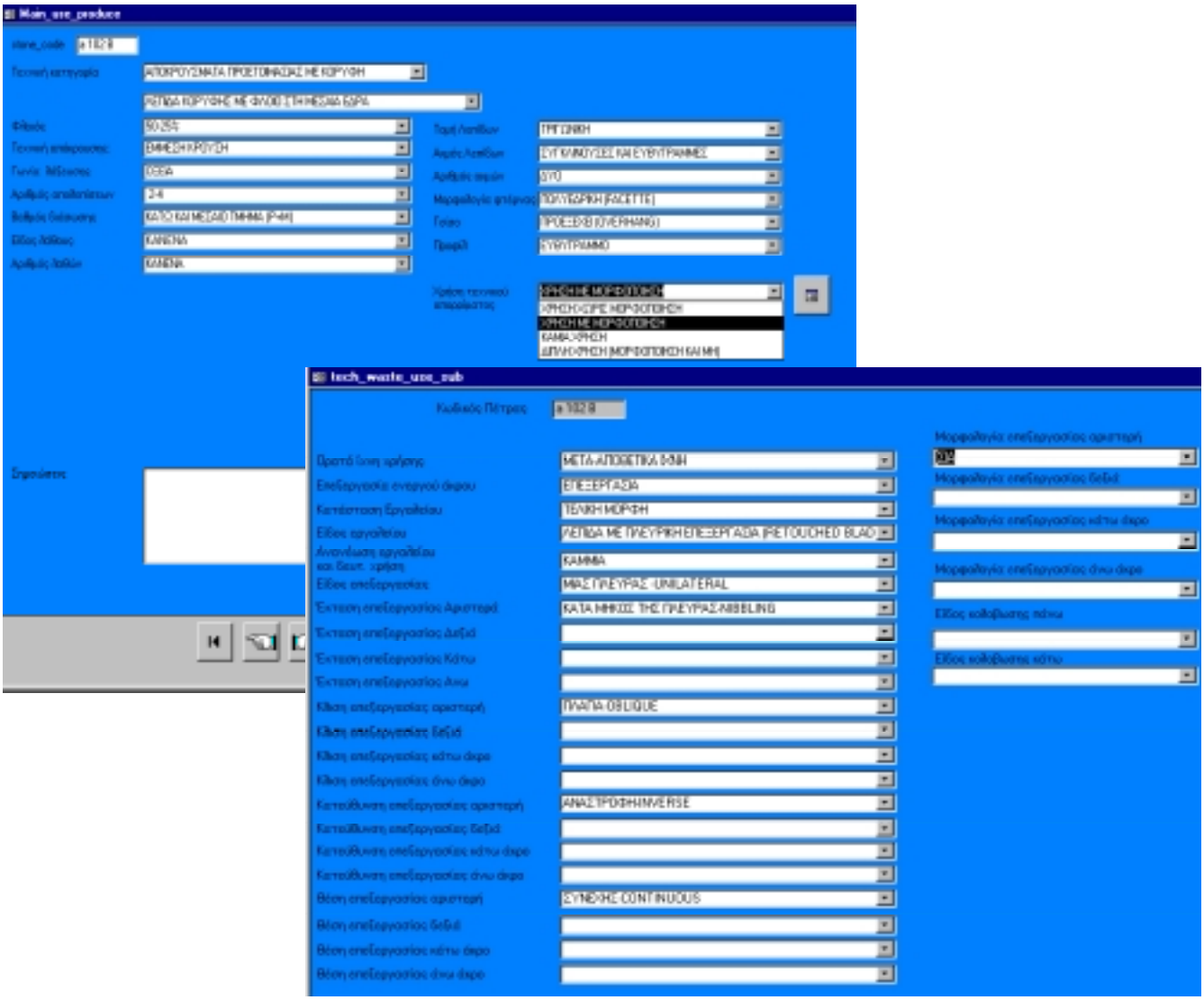
Main_use_produce
tech_waste_use_sub
ΑΠΟΚΡΟΥΣΜΑΤΑ ΠΡΟΣΤΟΦΑΣΙΑΣ ΜΕ ΚΟΡΥΦΗ
ΜΕΤΑ ΑΠΟΣΕΤΙΚΑ ΕΛΗΝ
ΕΠΕΞΕΡΓΑΣΙΑ
ΤΕΛΙΚΗ ΜΟΡΦΗ
ΚΑΜΜΑ
ΜΑΣ ΠΛΕΥΡΑΣ UNILATERAL
ΚΑΤΑ ΜΗΚΟΣ ΤΗΣ ΠΛΕΥΡΑΣ ABBELING
ΠΛΑΪΝΑ OBLIQUE
ΑΝΑΣΤΡΟΦΗ INVERSE
ΣΥΝΕΧΗΣ CONTINUOUS

Figure 5