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THE MESOLITHIC-NEOLITHIC TRANSITION IN THE TRIESTE KARST (NORTH-EASTERN ITALY): POSSIBLE CLUES FROM THE ANALYSIS OF LOCAL *VERSUS* EXOTIC LITHIC INDUSTRIES

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Introduction

If we consider the traditional polarization between theories of allochthonous or autochthonous processes of Neolithization, as well as the theories that combine the two approaches, such as the Availability Model of M. Zvelebil (1994), we acknowledge easily that the possibility of distinguishing local from exotic objects and phenomena can play an important role in the study of the Mesolithic-Neolithic transition.

Nevertheless such a distinction is often difficult, due not only to the different stages of development of the analytical methods currently used, but also because of possible misunderstandings derived from the lack of clear conceptual definitions. Consequently, before discussing the situation in the area under examination we want to say that in our attempt to contextualize exotics we have chosen to adopt the theoretical definitions given by A. Schofield and D. Olausson.

The identification of what could represent the result of the interplay of physiographical and cultural elements in a given area is in fact of primary importance: this implies to investigate "1st. the spatial and/or temporal context in which an artefact was lost or discarded. 2nd. the circumstances relevant to that loss/discard event ... : ... the specific behavioural context ... the social, economic and political conditions ... - the link, in other words, between material culture and culture generally", but also to evaluate the "3rd. academic and philosophical context in which items are studied" (Schofield 1995: 4).

Within such a frame, foreign objects – i.e. "which originate at some (unknown) distance from the site under study" – can be revealed by the "1) identification of raw materials which are spatially removed from the site under investigation, 2) stylistic elements or techniques which differ from others of the same class of objects on a given site" and can be recognized when "3) two objects [are] found in different contexts at two sites, 4) [there is] a lack of local precedent for a given type, or 5) a limited spatial distribution" (Olausson 1988: 15). Moreover, "the possible mechanisms by which foreign objects are introduced into a given archaeological context can be: 1) the movement of objects alone (trade and gift exchange), 2) objects moving with individuals (traders, craftspeople, bride exchange, etc.), 3) objects moving with groups of people (colonization, war and foraging), and 4) the movement of ideas, not objects" (Olausson 1988: 18).

1 - The Trieste Karst: available data

These concepts must be checked against the available data. The situation of the Trieste Karst region cannot be presented in detail here[1], so we will list only the evidence that we consider most relevant to the subject.

In particular:

-caves and few rock shelters represent the only sites from the Lower Palaeolithic to the Middle Bronze Age;

-over 150 caves (including rock shelters) with archaeological remains have been discovered since the late 19th century: they have been investigated by both amateurs and professionals, with a consequent high variability in the quality of the information

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[1] The physiographical situation, some notes on the history of research and an outline of the prehistoric cultural evolution of the Trieste Karst are contained in Montagnari Kokelj 2001, 2003, in press (with extensive references to previous literature).

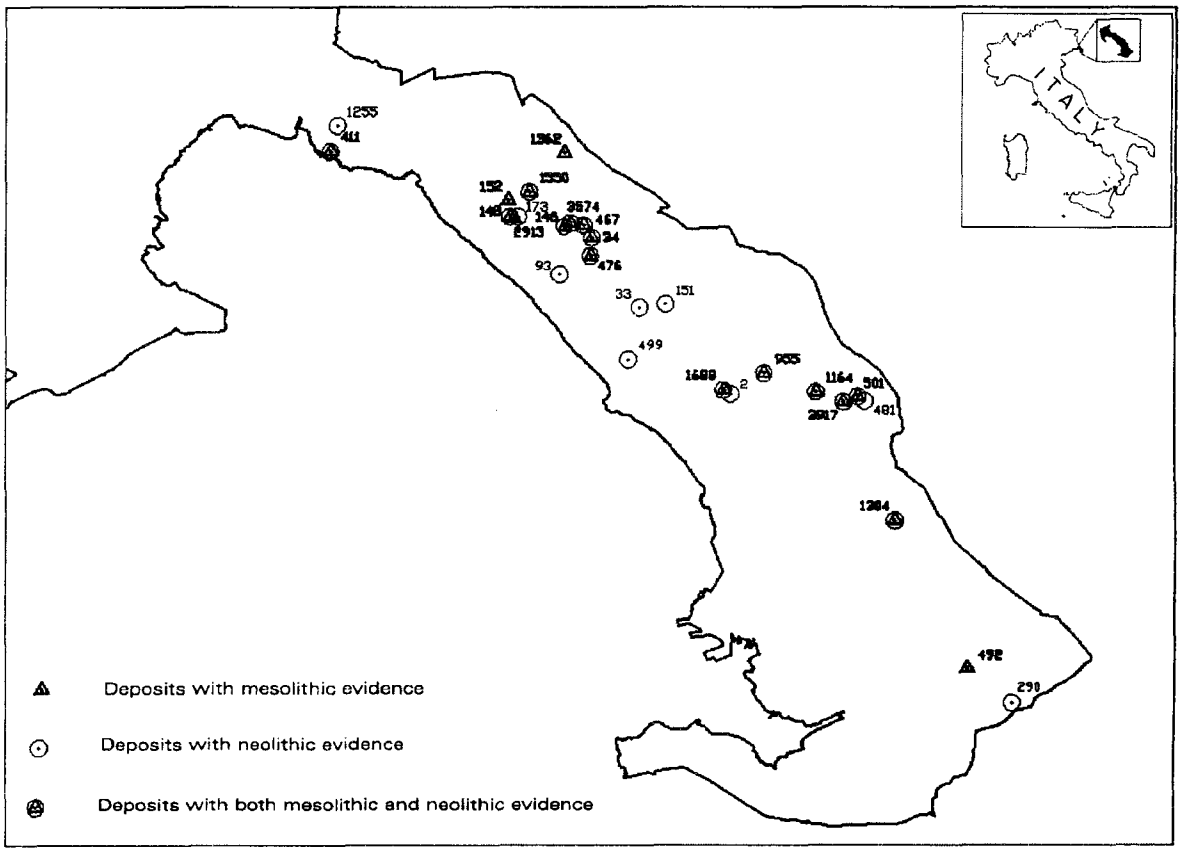

Figure 1. Distribution map of mesolithic and neolithic sites of the Trieste Karst (elaborated by A. Rossi and C. Piano, Department of Geological, Environmental and Marine Sciences, University of Trieste, Italy).

recovered[2];

-in the last 20 years only one deposit with both Mesolithic and Neolithic – grotta dell'Edera – has been systematically excavated, but only few notes have been issued so far;

-the Mesolithic is present in 18 sites and the Neolithic in at least 23 sites, with a high percentage of overlapping (see below and fig.1)[3];

-as to lithics: till now the mesolithic industries have been studied essentially on typological grounds, while the neolithic ones have often been merely illustrated;

-complete re-examination and publication of neolithic and post-neolithic materials from old collections started in the early 1990s and are still in progress;

-interdisciplinary studies – in particular petrographical analyses, sedimentological and soil micromorphological analyses – have been carried out over the same period.

The latest research developments have added new elements to the analysis of the Neolithization process made ca. 10 years ago by one of us (Montagnari Kokelj 1993; see also Boschian & Montagnari Kokelj 1984), without changing its basic conclusions. Probably the most negative of these conclusions was, and still is, the discrepancy between the high quantity of deposits which might document the Mesolithic-Neolithic transition, on the one hand, and the often low quality of the relative data, on the other.

As to the Mesolithic, this discrepancy is at least in part dependent on the fact that only 8 out of the 18 potential deposits have actually been excavated, sometimes with long, successive campaigns: Azzurra

[2] The implementation of a GIS-supported database of all these caves is in preparation (Montagnari Kokelj *et alii* 2003).

[3] The sites on the map are the following: Mesolithic: Benussi 1362 (regional cadastral number), Trincea 492, Riparo Zaccaria 2913, Ladroni 152; Mesolithic and Neolithic: Azzurra 34, Tartaruga 1688, Edera 3574, Lonza 1164, Caterina 146, Zingari 955, VG 4245 - 1304, Pettirosso/Vlaška Jama 148, Gialla 467, Riparo di Monrupino 3917, Ciclami 501, Ansa 1550, Teresiana 411, Moser/Muschio/Jama na Dolech 476; Neolithic: Gallerie 290, Orso di Gabrovizza 33, Cotariova 151, Gigante 2, Mitreo 1255, Tre querce 481, Pocala 173, Tripoli 93, Bersaglio militare 499.

(1961-63, 1982) – the cave where the Mesolithic was first identified and that remains one of the most important sites –, Benussi, Tartaruga (1962-64, 1965-67), Edera (1975, 1990-2002), Lonza, Caterina, Zingari, VG 4245. In the other cases, mesolithic layers have been exposed but not investigated in 2 caves, Pettirosso/Vlaška Jama and Gialla, and in 2 rock shelters, Monrupino (but the allegedly mesolithic materials could be neolithic instead) and Zaccaria; mesolithic artefacts have been recovered at Ciclami, Trincea and Ansa (though the microliths from Ansa could date to the Copper Age); the presence of mesolithic artefacts is sustainable only on the basis of information found in literature in the case of Teresiana, Moser and Ladroni (with doubts for Moser and Ladroni).

Furthermore, the stage immediately preceding the Neolithic would be present in 10 out of the 18 possible mesolithic sites if we include non-investigated sites such as Monrupino (but see above), Trincea and Teresiana, as well as Zingari and VG 4245 where single trapezes were found in the neolithic layers; but if we exclude them, the number of deposits with Late Mesolithic decreases to 5, i.e. Azzurra, Benussi, Tartaruga, Edera, Lonza (in the last instance with some doubts).

As no Neolithic is attested at Trincea and Benussi, when we consider the sites with both late mesolithic and neolithic evidence their number oscillate from 8 to 4 according to the exclusion criteria adopted.

2 - Old and new interpretations

It is clear that the limited or absent investigation, stratigraphic unreliability, the difficulty of comparing analyses carried out by using different typological lists[4] bear negatively upon both objective data and interpretations of the Mesolithic-Neolithic transition. In spite of this, some observations made in the past can be reconsidered now in the light of the new evidence.

As to the Late Mesolithic, trapezes are certainly not the only artefacts of the Castelnovian phase, but are the most diagnostic especially when the sample is biased by the lack of systematic water sieving. The 1961-63 excavations at Grotta Azzurra already revealed a low incidence of trapezes in comparison with the total number of mesolithic tools, and with that of microliths in particular; this observation, consistent with the results of later investigations in other deposits, has been confirmed by the 1982 campaign in the same cave (Cremonesi *et alii* 1984; Ciccone 1992).

The use of modern standards in field research and subsequent study of the materials has allowed to determine the incidence not only of trapezes, but of the whole late mesolithic components, and to focus on the relations among the different elements of the *chaîne opératoire*. Although not all data are published, also a broad comparison is significant: the mesolithic sequence in general includes 380 cores, 50 rejuvenation core flakes, 182 microburins, 13.498 unretouched blades and flakes, 41.601 débitage products and 2132 tools (including 55 microliths), while only 905 blades-flakes and 818 tools (with 92 microliths, 14 of which are trapezes) come from the levels dated to the Late Mesolithic (Ciccone 1992). The close structural analysis of the 1982 materials has thus confirmed a reduced human presence in the Karst during this period, limited to an early stage of the Castelnovian, revealing at the same time that there are no evident changes in the techno-typological composition of the lithic industries between the Early and Late Mesolithic.

A further decrease in site use, indicated among other things by a reduction in the number of lithic artefacts, but a drastic change in terms of typology, technology and raw materials characterize the post-Mesolithic sequence of Grotta Azzurra as well as of other caves. Few data are sufficient to understand the dimensions of the phenomenon: 2356 mesolithic tools were recovered in the 1961-63 investigations at Grotta Azzurra *vs.* 7 flint pieces (1 tool) and 274 pottery sherds from the neolithic level, 2132 *vs.* 0 and 30 respectively in the 1982 investigations; 613 mesolithic tools *vs.* 21 neolithic pieces (2 tools) and 87 sherds come from the 1975 excavations at Edera[5].

In these cases the results of recent sedimentological and soil micro-morphological analyses offer a well-founded explanation: they indicate in fact that the post-Mesolithic layers of these deposits[6] are coprogenic, i.e. that these caves were used repeatedly, though probably discontinuously, as stables (Boschian & Montagnari Kokelj 2000).

Direct evidence of *fumier* layers – made up of thoroughly disaggregated and burned herbivore droppings, that can take the form of layered heaps of ashes and charcoal with high quantities of spherulites and phytoliths or of sub-horizontal, broadly spaced and rather wide homogeneous brownish deposits with interbedded black and white lenses and layers (Fig.2) – have been found also at Caterina and Lonza, while

[4] The typologies more commonly used are those elaborated by the School of Pisa and by G. Laplace, but others have been occasionally used too (the articles included in the volume *Il Mesolitico sul Carso triestino* 1984 exemplify the situation).

[5] These figures are taken from the literature and from recent, still unpublished re-examinations of the post-Mesolithic materials of the old collections.

[6] The preliminary information on the 1990-2002 excavations at Edera confirm the previous data.

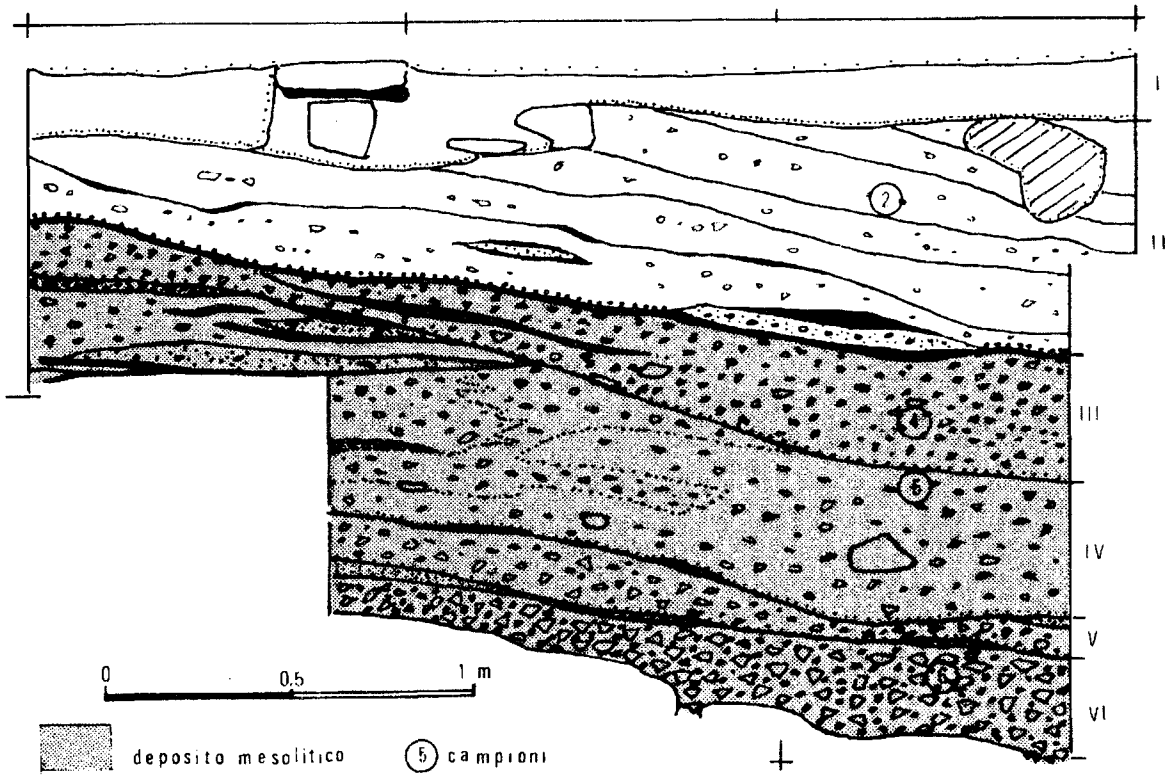

Figure 2. *Fumier* layers of Grotta Azzura (from Boschian & Montagnari Kokelj 2000).

the re-interpretation of old data suggests a similar use in the case of Zingari, VG 4245, Cotariova and Orso[7].

Stabling is likely to have started already in the Early Neolithic[8], even if the beginning of this activity is often difficult to ascertain beyond doubt, owing to the scarcity of material remains – which is a typical correlate of this specialized practice – but also because the boundary between mesolithic and neolithic deposits is often a paraconformity, that is a sedimentary *hiatus*. This means that if transitional layers had ever been present, now they are no longer preserved.

The implications of this situation are still to be evaluated completely, and the results of the 1990-2002 investigations at Grotta dell'Edera can be important. Here the *fumier* layers and the available C14 dates, though perhaps not fully reliable due to the high standard deviation[9], suggest that the reworking of older strata was a primary process in the formation of layer 2a, where the first stage of the Neolithic is documented by materials of the Vlaška cultural aspect.

As a matter of fact, the Adriatic early neolithic Impressed Ware culture would not be present in the Karst: the few Impressed Ware pottery fragments allegedly found at Pettirosso/Vlaška Jama, Orso, Gallerie, Ciclami and Azzurra have not been traced in the recent re-examinations of these caves, with the only exception of a single sherd found at the base of the neolithic layer in the 1961-63 excavations at Grotta Azzurra (Cannarella & Cremonesi 1967: 298, fig.5/1). In our opinion, this fragment, like those of two coarse vessels found together with late mesolithic flint artefacts in layer 3a of Edera and identified as of non-local production through preliminary archaeometrical analyses (Spataro 1997-1998: 72), might simply indicate the first contacts between local mesolithic communities and foreign neolithic groups, as postulated by M. Zvelebil in the Availability Model elaborated for the study of the processes of Neolithization and tentatively applied also to the eastern Adriatic regions and the Balkans (Zvelebil 1994: in particular 116-120).

[7] The re-interpretation of the data from Grotta dell'Orso was not included in Boschian & Montagnari Kokelj 2000, and is based on the description of the deposit given in literature (Marchesetti 1890: 162).
[8] This chronology is almost certain at Azzurra, Edera, Zingari, VG 4245 and highly probable at Orso.
[9] Layer 2a: 6305 ± 285 BP, 6445 ± 210 BP, 6590 ± 100 BP; layer 3a: 6700 ± 130 BP (Spataro 1997-1998: 66).

3 - Further considerations

The characterization analysis of the raw material of the lithic artefacts associated with pottery in layer 3a of Edera, as well as of other vessels from the neolithic level at Azzurra could confirm, or disclaim, this hypothesis. Similar analyses of materials from other deposits where the Mesolithic-Neolithic transition is likely to be documented might demonstrate that the situation of Edera and Azzurra exemplifies a more generalized local phenomenon.

However, we believe that the interpretation of the results will not be straightforward, because it always depends on the theoretical models used by individual scholars[10], and because models created to study different phenomena can/must overlap, as in archaeological contexts there is very often a "problem ... of equifinality: that a number of different processes can lead to the same resulting pattern" (Scarre 1993: 2).

As to lithic industries, for instance, the presence of exotic materials can be the result of direct procurement by local groups as well as of direct or mediated exchange, where the functional value and the symbolic value of objects are usually inextricably connected. Mobility, which is typical of both hunter-gatherers and pastoralists, can enhance one mechanism or the other, or their interplay.

In such cases only a strict contextual analysis combined with the study of all data on lithic typology, technology and raw material might hint at the processes involved, but a complete coverage of these aspects is not frequent. Moreover, two other facts concerning the identification of raw materials should not be underestimated: characterization analyses do not have the same degree of reliability, due to the intrinsic characteristics of the materials and/or to the developmental stage of the techniques themselves; as the geological formations of possible origin could be located far from the area under examination, the possibilities of recognition are dependent on the dimensions of the geo-archaeological mapping of the sources.

The outline of the general situation of the Karst and of the situation relative to lithic industries at the Mesolithic-Neolithic transition presented so far can be integrated by few observations on the points touched just now. If we consider the most common lithic classes – flint, obsidian and greenstone – we can say that the characterization studies of obsidian are probably the most advanced. Few artefacts were recovered in neolithic contexts of the Karst[11]: they were analysed ca. 20 years ago by means of Instrumental Neutron Activation Analysis and the results indicate that most of them come from the Lipari islands, in southern Italy, while one single item comes from the Carpathian basin, more precisely from the source area of Szöllöske and Malá Toroňa in Slovakia (Williams Thorpe *et alii* 1984). The fact that no cores or other elements of the *chaîne opératoire* were found together with the obsidian artefacts would indicate that these objects were manufactured elsewhere and entered the Karst as finished products.

Greenstone – the archaeological name of metaophiolites of high pressure, commonly used in the production of polished tools – has petrographical characteristics that, combined with sophisticated techniques of analysis, allow a reliable identification of the source. Ca. 50 polished stone artefacts of different typology – mainly axes/adzes and shaft-hole axes, but also other tools and ornaments – and different chronology were found in Karst caves, and many of them are still preserved (Montagnari Kokelj 2000). In the second half of the 1990s a small lot of shaft axes, of post-Neolithic age, was examined by means of Stereomicroscopy, X Rays Diffractometry and S.E.M. (Scanning Electronic Microscopy): the results exclude their origin from north-western Italian sources, and point to a probably eastern provenance from geological deposits still unidentified (D'Amico *et alii* 1996). A strong orientation of the Karst towards regions to the east and south-east throughout the late prehistory emerged already at the middle of the 20th century, mainly through studies of ceramic materials: new analyses of the neolithic greenstone artefacts could further confirm this tendency. The different state of preservation of greenstones, ranging from complete, apparently non-utilized artefacts to fragments of worn-out tools, as well as the apparent lack of production waste, are two other elements that deserve close attention in order to hypothesize the mechanisms of introduction into the local contexts.

The reliability of characterization studies of flint is highly debated at theoretical level. In any case, analyses of materials from Karst deposits have been carried out so far only at macroscopic level and only in few instances, essentially Edera – 1975 excavations (Boschian & Pitti 1984) and Azzurra (Cannarella & Cremonesi 1967; Ciccone 1992) for the Mesolithic and Zingari (Gilli & Montagnari Kokelj 1994-1995) for the Neolithic. Moreover, the implementation of a GIS-supported database of the regional primary and secondary chert formations is in progress (Montagnari

[10] See Bruckner & Montagnari Kokelj 1998 for some comments with special reference to the circum-Adriatic regions and the Balkans.

[11] The attribution to the Neolithic, though almost certain, is not always supported by stratigraphic data.

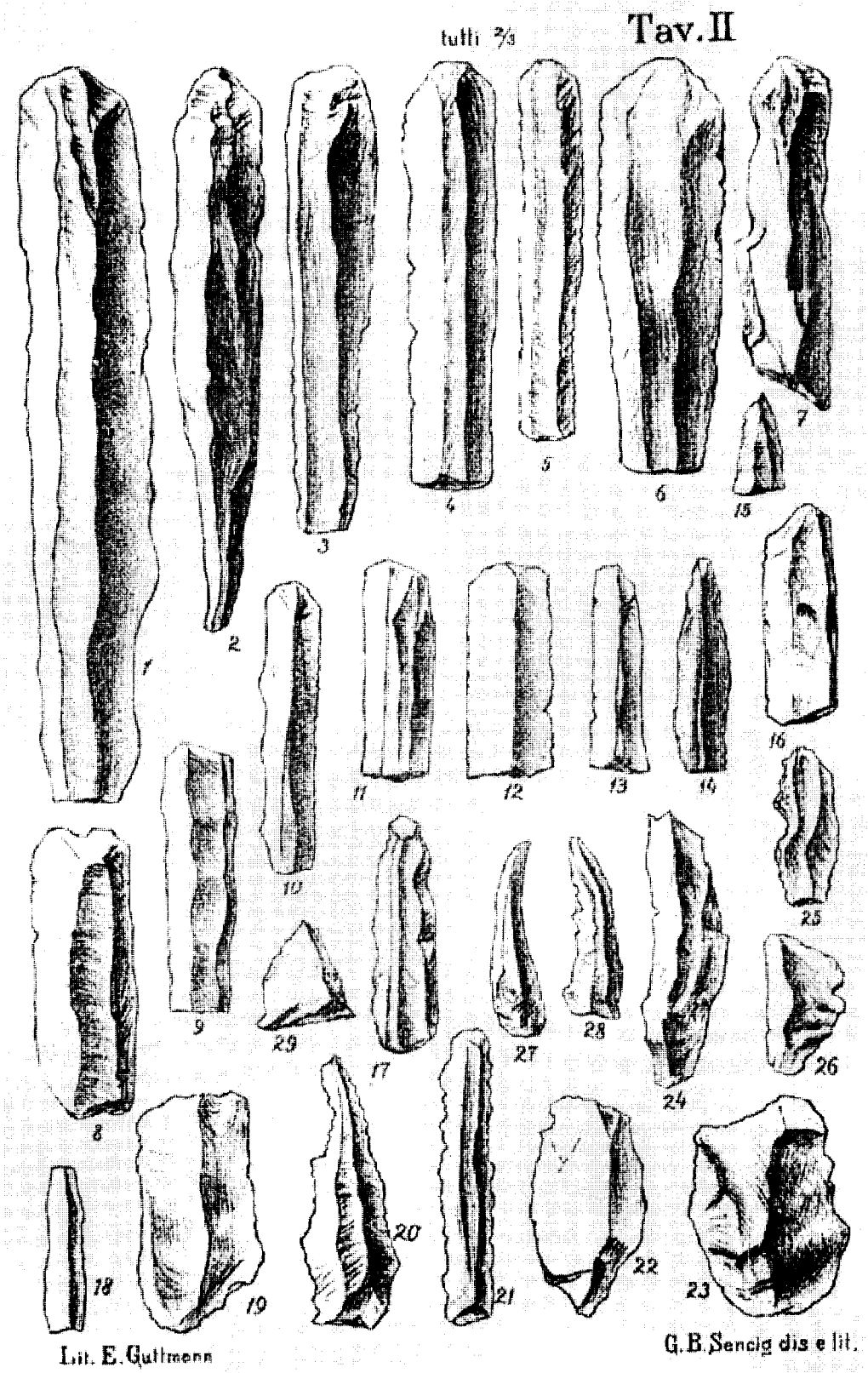

Figure 3. *Long blades* and other materials from Grotta dell'Orso (from Marschesetti 1890).

Kokelj *et alii* 2003a), but similar instruments of analysis are not yet available for the surrounding areas. Nevertheless, by combining the available data we can maintain that there was a prevailing use of local chert during the Mesolithic, with a limited presence of non-local lithotypes of good quality that seem to be more common in its recent phase; these lithotypes become predominant in the Neolithic and remain so in later periods (see also Boschian in press). As to the Neolithic, these data are consistent with the changes in typology and technology, as well as in use of the sites, indicated above.

At present, though we can be quite confident of the exotic origin of most neolithic and post-neolithic flint artefacts, we can only guess about their origin. A preliminary macroscopic analysis would indicate a generic similarity with lithotypes present in the Lessini Mountains of northern Italy, on the one hand, but also along the eastern Adriatic coast, on the other[12]. This resemblance is not really surprising, because similar and coeval sedimentary environments and diagenetic processes can produce lithofacies that are not easily distinguishable at macroscopic level when the samples are no longer *in situ* and specific markers of various nature – palaeontological, palinological, mineralogical, etc. – are missing. A close analysis first of the microfacies, and then of the palinological aspects, the mineralogical ones, etc. is necessary to try to characterize the artefacts with more precision.

The techno-typological characteristics of the industries do not seem to be discriminative either. As a structural analysis of the industry is often impossible, due to the very low number of artefacts and/or to problems of stratigraphic position (see above), the study cannot but focus on single artefacts, essentially on the most typical ones, if present. But even these can be ambiguous: *long blades*[13] with triangular or trapezoidal section, sometimes retouched, are a case in point, also because they would appear in different periods in different cultural contexts. In the Karst a few artefacts that can be defined as *long blades* with relative confidence have been found at Orso[14] (Fig. 3) (Marchesetti 1890), Azzurra (Marchesetti 1895; Bregant 1957), Lonza (Lonza 1973-74), Ansa (Marzolini 1975-77) and Monrupino (Cannarella *et alii* 1973-1974): in the first two cases their association with pottery of the Early-Middle Neolithic Vlaška cultural aspect is possible but is not supported by stratigraphic data, while in the other cases it is almost certain. In relatively close areas and in the same timespan *long blades* are present in the Dalmatian Danilo culture (Korošec 1959: tav. 55 ff.)[15], but also in the northern Italian Fiorano culture (see for instance Barfield 1972: 192). The strong cultural connections of the Karst with the Danilo culture, testified mostly by pottery and known at least since the 1960s, are balanced by single elements pointing to Fiorano[16]: which of these areas is then responsible for the presence of long blades here? is the Karst acting as a mediator of long-distance contacts? if we consider the pastoral vocation of the Karst and the fact that *grottes-bergeries* would be specialized flock-parking sites on plateaux visited seasonally by shepherds moving from complementary open air settlements in lowlands or valleys, we can easily admit that these questions are destined to remain open, unless we collect new data from local sites as well as from far-off areas.

Conclusions

To sum up, we can say that, in spite of the limitations inherent in old data, a re-examination of the most significant lithic contexts aimed at studying subjects essentially neglected till now, such as the relationship between raw materials and different components of the *chaîne opératoire*, could give interesting results.

In more general terms, a re-analysis of the process of Neolithization from the viewpoint of the lithic industries would represent "an alternative approach", as said by J. Kozłowski some 15 years ago. The possible continuity of techno-typological traditions from the early phase of the Mesolithic to the recent one, but the apparent break at the Mesolithic-Neolithic transition might indicate that the Karst is oriented towards the Balkan-Danubian zone rather than to south-western Europe, according to the interpretation given by Kozłowski (1989). Nevertheless, this break often corresponds to a sedimentary *hiatus*, and consequently we do not know whether single sites, or

12 We want to thank L.H. Barfield for the information on the Adriatic area.

13 The definition itself of *long* blades is somehow ambiguous, as it depends on the metrical parameters used (see for instance Bagolini 1968: in particular 195-199).

14 A comparability of the artefacts from Grotta dell'Orso with the long blades/super-blades of the Bulgarian Copper Age – first hypothesized by T. Tsonev on the occasion of his visit to the Museo Civico di Storia ed Arte of Trieste (Italy), preparatory to the ESF Exploratory Workshop *The humanized mineral world: towards a social and symbolic evaluation of prehistoric technologies in South Eastern Europe* (Sofia, Bulgaria, September 3-6, 2003) – cannot be excluded *a priori* due to a basic comparability of geological processes that, as just said, can generate confusing macroscopic similarities of materials.

15 L.H. Barfield is among the first scholars who have underlined this similarity (Barfield 1972: 203).

16 These elements are limited to few rhomboids from Grotta Lonza (Lonza 1973-74: fig. 5/12,17,19-20,22; 1 unpublished piece) and single pottery sherds from Ciclami, Gallerie, Pettirosso/Vlaška Jama and Moser/Muschio/Jama na Dolech (Barfield 1972: 203), but the latter are only loosely comparable.

the whole area, were really involved in the Neolithization or not. On the other hand, on the basis of the most recent studies we can assume a rather generalized involvement in transhumant pastoralism, and this opens up new avenues of research that we have already started exploring (Montagnari Kokelj in press).

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