Raiko Krauss and Harald Floss (Eds.)

SOUTHEAST EUROPE BEFORE NEOLITHISATION

Proceedings of the International Workshop within the Collaborative Research Centres SFB 1070 "RessourcenKulturen", Schloss Hohentübingen, 9th of May 2014

RessourcenKulturen Band 1

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River Danube at the Iron Gates the 'Small Cauldrons' at Dubova, seen from the Serbian shore (see the contribution by Ciocani, 168).

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Die Sprecher des Sonderforschungsbereiches 1070
RessourcenKulturen
Martin Bartelheim
Roland Hardenberg
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Publishers’ Foreword

This is the first volume in the series ‘Ressourcen-Kulturen’, a medium for the publication of the results of SFB 1070 ResourceCultures, a collaborative research centre located at Tübingen University and funded by the German Research Foundation (DFG). Primarily the series will include dissertations, monographs and conference publications. In order to ensure compliance with common standards of quality control all volumes are subject to an international peer review procedure.

The series will reflect the wide range and the interdisciplinary cooperation of the research centre, including several archaeological disciplines (Prehistoric Archaeology, Medieval Archaeology, Near Eastern Archaeology, Biblical Archaeology, Classical Archaeology and Scientific Archaeology) as well as Social and Cultural Anthropology, Geography (Human Geography, Physical Geography and Pedology), philologies (Classic Studies, Ancient Near Eastern Studies), and historical sciences (Ancient History, Medieval History, Economic History).

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With this series of publications we aim to create a tool for the circulation of findings attained by the work of the collaborative research centre in order to stimulate a lively scientific discussion.

The spokespersons of SFB 1070 ‘ResourceCultures’
Martin Bartelheim
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DUŠAN BORIĆ AND EMANUELA CRISTIANI

Social Networks and Connectivity among the Palaeolithic and Mesolithic Foragers of the Balkans and Italy

Keywords: hunter-gatherers, social networks, shouldered pieces, personal ornaments, decorated portable art

'For a number of reasons, including reproduction, the behavior of humans and their nonhuman primate relatives needs to be broadly circumscribed in space. Humans (and primates) are always in webs of interaction with their conspecific neighbors and their neighbors' neighbors.' (Wobst 2000, 221).

'Along the Pacific coast where lived small nations that, even though speaking mutually unintelligible languages (numbering several dozens), were trading with each other. (...) dentalia shells gathered only in the Puget Sound and north of it were much in demand in California. In the other direction, the mother-of-pearl, from abalone shells that came from southern California was traded all the way up to the British Columbia and Alaska, where it was used in making jewellery and other precious objects. I have cited in The Naked Man *(...) a long text from Teit on the intertribal fairs held on the lower Columbia as well as inland, a text that draws startling picture of commercial exchange among peoples sometimes very far removed from one another…'* (Lévi-Strauss 1995, 179 f).

Abstract

Major environmental perturbations over the last glacial period, with considerable changes in sea levels, have significantly affected the spatial organization of Palaeolithic and Mesolithic hunter-gatherer communities between the Balkans and Italy.[1] For this reason, these regions are an ideal case for studying how different environmental factors could affect connectivity among human groups and rates of innovation.

Italy and the Balkans are also key transitory regions for various dispersal events in the evolutionary history of the European continent that brought different hominin taxa into Europe from the areas of Africa and south-western Asia. Yet, compared to various well-researched regional hotspots in central and western Europe, the picture of the Palaeolithic and Mesolithic adaptations re-

1 We thank Dimitrij Mlekuž for the base map of the Balkans and Italy used in this article, Paola Ucelli Gnesutta for her help with evidence from Settecanelle, and Robert Whallon for the permission to adapt his drawing in our fig. 15. Dušan Borić thanks Raiko Krauss and Harald Floss for organizing intellectually stimulating and enjoyable workshop in Tübingen in May 2014 where a version of this text was presented.

mains coarse-grained in particular in the Balkans as a result of a historical research bias followed by unsettled recent history preventing the application of new research methodologies. In this paper, we aim to highlight particular examples of connectivity across large tracks of land during the Palaeolithic and Mesolithic and to point out the potential that social network thinking has in the study of the Balkans and Italy.

Social Analysis in Hunter-Gatherers Studies: A Theoretical Context

Traditionally, in the scholarship dedicated to the study of early prehistoric periods, and in particular the Palaeolithic, interest has primarily been focused on taxonomic ordering of diagnostic artefact types, ecological/environmental aspects of the evidence and/or explanations that prefer broad evolutionary trends. Culture-historical, evolutionary behavioural ecology, or Neo-Darwinian approaches (cf. Bettinger 1995) are the backdrop to such dominant agendas in this research field. The interest strongly remains to uncover decisive breaks or 'missing links', focusing on origins and revolutions as the main currency of invested debates (Gamble 2007).

Similarly, the study of social organization of forager communities has often been limited to the preconceived umbrella concept of band-level societies that are applied uniformly to most if not all forager societies worldwide and throughout human history, despite ethnographic evidence for a much larger array of organizational forms, which also must have characterised foraging societies of the past (Binford 2006). Group-centred approaches in anthropological and sociological analysis of hunter-gatherer social contexts see human societies through an architectural metaphor of a given edifice with little space for individual agency to make a difference and within a stadial view of social evolution (Gamble 1999). Wobst argues, 'researchers of quite contrasting paradigms tend to perpetuate the same "environmental" bias in their presentation of forager data' (Wobst 2011, 269). These deeply rooted ways of looking at hunter-gatherer societies in early prehistory hamper any potential for developing more nuanced approaches that would open up the study of these early periods to new conceptual horizons.

Going beyond the focus on environmental constraints and social institutions in forager studies one could usefully utilize various paths provided by network theory and social network analysis (SNA), which allow us to sidestep the dichotomy between the structure and agency, society and individual through a multi-scalar approach to social reality (Gamble 1999). The focus on SNA in social sciences has proved useful in conceptualizing and analysing the increasing complexity of personal and institutional relationships in the present-day context. Recent research emphasizes the antiquity and uniqueness of the social networking faculty in humans, singling out the aspect of co-operation in establishing ties with both kin and non-kin as a feature that must have been present in early humans (Apicella et al. 2012). The core properties of social networks bridge past and present, simple and complex social contexts.

Regarding the development of hominin sociality, anthropological research has shown that by 300.000 BC the neocortex of the brain was developed enough to maintain social relations with networks of around 120 and up to 150 people (Aiello/Dunbar 1993; Dunbar 1996). In this context, the question emerges about the type of communication mechanisms for the maintenance of such social networks, with the importance of rudimentary forms of language in order to transcend physical aspects of social 'grooming' through a kind of 'vocal grooming' (Gamble 1999, 261). The latter is also based on the antiquity of FOXP2 language gene (Krause et al. 2007). Moreover, the Social Brain Hypothesis predicates that novel cultural and biological mechanisms were evolutionary responses to the increasing need to integrate more individuals and other social units (some of which are only infrequently encountered) into social networks that encompassed wider communities and dispersed social systems as the consequence of social complexity (Gamble et al. 2011). The expensive tissue hypothesis links these various strands of evidence for the evolutionary development of human (and generally primate) brains and suggests that the process of encephalization, i.e. the development of larger brains, seen as physiologically expensive tissue, required higher protein intake derived from largely carnivorous and generally higher quality dietary habits (Aiello/Wheeler 1995; Powell et al. 2010). Concomitant changes must have ensued in patterns of resource procurement and life strategies in order to maintain these bigger brains (Foley/Lee 1996).

Gamble (1999) has suggested three main levels of personal networks that would apply to hominin species in order to conceptualize the structure of hunter-gatherer social life: (a) intimate networks (~five individuals that can be equated with a nuclear family or any 'significant others') relying primarily on emotional resources in maintaining relations; (b) effective networks (~20–25 individuals that in the context of hunter-gather societies can be equated with minimal bands, thus corresponding to lineage and village groups) mobilizing emotional but also material and to a lesser extent symbolic/stylistic resources; and (c) extended networks (100–400 individuals that would correspond to effective breeding units or tribal groups of a maximum band comprising up to 500 individuals), which, while to lesser extent relying on emotional resources, often mobilize material and in particular symbolic/stylistic resources. While in this way defined levels of social networks bear resemblance to the so-called magic numbers often used in understanding the demography and defining institutions of hunter-gatherer studies grounded in various ethnographic examples around the world (Birdsell 1973; Kelly 1995; 2013; Wobst 1974), Gamble's approach calls for questioning of a group-based model of society as such, emphasizing the need to refocus our attention to the key role of individuals within social networks. Network theory analysis, which views social relationships in terms of nodes (individual actors within networks) and ties (representing relationships between the individuals), provides a methodological framework for a much needed novel approach to the study of social agency in Palaeolithic and Mesolithic archaeologies. Apart from Gamble's (1999) pioneering works in advocating this type of approach, there has been little dedicated attempt to apply network theory analysis in the study of Palaeolithic and Mesolithic periods with some notable exceptions (Coward 2010; 2013; Whallon 2006).

Environmental Changes, Population Size and Social Networks

Binford (1980) suggested archetypical movement strategies for foragers, splitting them into 'collectors', i.e. logistically organized groups that move infrequently within a tethered pattern of mobility in contrast to 'foragers', i.e. groups characterised by a high degree of residential mobility who frequently relocate their camps. This dichotomy of ideal types rarely works as such and should be seen as a range, whereas a much wider spectrum of types and commitments to mobility should be envisaged. For example, there are documented forager groups that are residentially stable at the locus of concentrated and predictable resources (e.g., Heffley 1981; Kelly 1995; 2013) and network (social) mobility and informational mobility have recently been stressed by Whallon et al. (2011; cf. Whallon 2006). While Binford emphasized the movement across landscapes as part of embedded procurement, i.e. primarily as part of subsistence-oriented movements, one should also account with 'non-utilitarian' movements, such as those related to exchange, as in Bushmen's *!hxaro* (Wiessner 1982; cf. Whallon 2006; Whallon et al. 2011). Subsequently, Whallon (2006, 262 f.) distinguished four types of mobility: residential mobility, logistical mobility, 'network mobility' (visiting kin and other socially significant others) and 'information mobility' (e.g., visiting sacred sites, ritual and ceremonial movements), but stresses that one should not expect sharp boundaries between the character of these theoretically differentiated types of mobility.

It seems reasonable to assume that among prehistoric hunter-gatherer societies, beyond intimate networks of ~five individuals (family unit) and effective networks of ~20–25 individuals (band), extended networks of up to 500 individuals corresponded to effective breeding units or tribal groups of a maximal band (Gamble 1999). Within such maximal bands cultural practices were transmitted, learned and shared, resulting in similarities of technological know-hows and material culture styles. For instance, in such maximal bands exchanges of flint raw material at distances of up to 150 km were common. In these small-world-like societies strong ties depended on frequent face-to-face encounters. Yet, around ~45.000 BC, with the start of the Upper Palaeolithic in Europe, and possibly related to the spread of Anatomically Modern Humans (AMH), the archaeological record indicates an increasing importance of long distance connections beyond the territories of adjacent maximal bands (see below). Evidence of exotic marine shells found over 200 km and up to 800 km from their place of origin, as well as similarities in cultural practices and forms of artefacts over large territories suggest movements of people, objects, and innovations. Why were such connections among distant communities established? One answer to this question could be that it became important to establish regional networks as 'safety nets' in unpredictable and changing climates and environments (Whallon 2006). In harsher landscapes we could assume larger hunter-gatherer territories. Through gift-giving, exchanges, ceremonies and rituals, people might have relied on what is in network theory (Borgatti/Halgin 2011) referred to as the strength of weak ties of mutual rights and obligations among individuals who are not frequently encountered and who do not share the same cultural traditions and styles.

But the argument about 'safety nets' might appear overly utilitarian, providing a retrospective understanding and justification of social and cultural practices in terms of practical reason. In this tradition of anthropological thought culture is understood as 'constructed out of practical action and interest, as guided by a kind of super-rationality' (Sahlins 1976, 73). According to this view, cultural practices, which govern exchanges of 'exotic' items as well as patterns of resource procurement and mobility, are reduced to 'adaptive advantages'. Yet, collective forms of experience with shared representations often remain grounded in unreflected thought (Descola 2013, 74 f.) with the sociality of the human world always already being symbolically constituted along the grid of invariants that universally structure human mind (e.g., Lévi-Strauss 1987).

An alternative explanation is that offered by Gamble (2012) who, taking a much longer evolutionary view and building on the Social Brain Hypothesis (e.g., Dunbar 1996; Gamble et al. 2011), suggests the critical role of emotions in the creation and maintenance of larger social groupings and social networks among large-brained hominins. This author in particular emphasizes social emotions in dealing with others, such as shame, envy, jealousy and pride, which are the basic prerequirements for the existence of social institutions. In his view, emotions are used 'as a resource that can be amplified to strengthen social bonds' (Gamble 2012, 19).

A hypothesis could also be proposed that the establishment of extensive ('global') social networks and their maintenance since the start of the Upper Palaeolithic in Europe not only related to the rates at which novel behaviours spread, were adopted and developed, but also, more critically, to a widespread adoption and retention of certain innovations (cf. Davies 2012). Evolutionary, population-based models suggest that innovations are less likely to be selected and retained when population levels decline, which is often due to environmental/climatic deteriorations (*tab. 1*). In such models, a density of social networks is an important factor in the spread of innovations (Shennan 2001; Kuhn 2012; for a critique see Gamble 2012). This population size, 'too-few-trees/minds-in-the-forest' argument (Gamble 2012, 20), suggests that demographic effects of expansion and shrinking affect rates at which new and beneficial innovations appear and spread regarding the accumulation and retention of cultural skills. For instance, it is argued that cold phases caused the contraction of cultural diversity due to population decline and loss of cultural knowledge (e.g., Shennan 2001; Powell et al. 2009). These different factors are possibly linked but we often lack systematically collected and analysed data of sufficient magnitude and diachronic depth to examine these different factors together.

Three more specific hypotheses can be suggested taking into account demography, environmental/climatic factors, rates of innovations, and social networks:

- Rates of innovation and culture change are random, and were directly dependent on population size: high innovation rates are linked to periods of high population growth and vice versa;
- Even when population levels grew due to high resource availability, innovation rates declined;
- Despite low population size and/or environmental constraints, the strength of weak ties, which

	Environmental/ Archaeological proxies	High innovation rates	Low innovation rates
Climate/ Environment	Sea-level changes; pollen diagrams; speleothems	High resource availability in different biotopes	Concentrated and patchy resources in harsh environments
Population size/ density	Numbers of radiocarbon dates; site densities; thickness of arch. layers and artefact densities; diet breadth	Increase/high	Decline/low
Material culture and land use strategies	Techno-morphological properties of artefacts; techniques of hafting and use; faunal and plant remains	High diversity in tool forms and modalities of use; new ways of exploiting resources	Low diversity in tool forms and land use strategies (conservatism) over long periods of time
Social network properties	Movement of flint raw materials; movement of shells and other 'exotica'	High density networks of strong and weak ties	Isolated populations or connected beyond maximal band territories primarily through weak ties

Tab. 1. Summary of expectations regarding high and low innovation rates linked to parameters measurable for the Palaeolithic and Mesolithic along with specific environmental and archaeological indicators.

served as 'safety nets', in social networks allowed the spread of innovations due to high mobility.

The methodological challenge remains how best to estimate population parameters in Early Prehistory or measure rates of change and the diversification of material culture forms (e.g., through the development of stone artefacts typological categories) due to the low level of compatibility among different analysts. Hence, SNA is rarely applied in the study of network structures among foragers (but see Coward 2013). It is outside the scope of this paper to provide an analysis within a formal framework of SNA in relation to a particular empirical case study. Instead, we aim to highlight particular examples of connectivity across large tracks of land during early prehistory and to point out the potential that social network thinking has in the study of two related areas of south-eastern Europe: the Balkans and Italy.

Early Balkan and Italian Prehistory: Archaeological Context

Major environmental perturbations over the last glacial period, with considerable changes in sea levels, must have significantly affected the spatial organization of hunter-gatherer communities between the Balkans and Italy. It makes these regions an ideal case for studying how different environmental factors could affect connectivity among human groups and rates of innovation. The Balkans and Italy are also key transitory regions for various dispersal events in the evolutionary history of the European continent that brought different hominin taxa into Europe from the areas of Africa and south-western Asia. These southern European provinces yielded the first evidence of cultural and cognitive novelties and human fossil remains that mark the emergence of Upper Palaeolithic social contexts and behavioural and cultural complexity on the European soil. Compared to various well-researched regional hotspots in central and western Europe, the picture of the Palaeolithic and Mesolithic remains coarse-grained in particular in the Balkans as a result of historical research bias followed by unsettled recent history preventing the application of new research methodologies.

Both the Balkans and Italy are characterized by Lower Palaeolithic records with both human remains and artefacts dated to more than half a million years ago (e.g., Guadelli et al. 2005;

Kuhn 1995; Mussi 2002; Rink et al. 2013; Roksandic et al. 2009; Sirakov et al. 2010; Stiner 1994). There are also considerable Middle Palaeolithic records spread across both regions (e.g., Darlas/Mihailoviće 2008; Mussi 2002; Mihailović 2009; Peresani 2012; Richards et al. 2000; Rink et al. 2002). With regard to social networks in the Middle Palaeolithic of Italy and the Balkans, despite occasional evidence for longer stone raw material transfers, up to 100 km as shown by case studies from southern Italy (Spinapolice 2012) and Hungary (Kozłowski 1994), and often related to the use of Levallois technique in the course of the later phases of the Middle Palaeolithic (Gamble 1999, 265), local raw materials are the predominant component of knapped stone assemblages. Such local networks in raw material transfers did not often exceed distances of 15 – 20 km from the place of gathering/habitation/disposal. Mellars suggests that in the Middle Palaeolithic 'variable degrees of social distance maintained between human populations' led to 'separate patterns of technological development' (Mellars 1996, 355). Neandertal populations largely dwelt within their immediate landscape of habit, i.e. within what Gamble defines as intimate and effective networks (see above). In other words, Neandertal social life depended 'on co-presence and the reaffirmation of bonds through regular contacts instilled in the practices of everyday life' (Gamble 1999, 265). Yet, as with earlier hominins, fission and fusion process for raw materials transport or communal hunt might have created an awareness of belonging to larger communities. It also seems that any innovation and new behaviours might have been localized in particular regional zones due to the lack of 'global' networks (Davies 2012).

It is only with the start of the Upper Palaeolithic that the recovered artefacts indicate the existence of cultural/stylistic links over much wider regions, suggesting the establishment of the first extended, 'global' social networks in Europe. The start of the Upper Palaeolithic in the Balkans and Italy has been for some time the matter of intense debate regarding the nature of the Middle to Upper Palaeolithic transition. In both regions, just before ~40.000 cal BP, several so-called transitional lithic industries are known based on the largely Levallois-derived reduction sequences – in the Balkans the best known is Bachokirian after the site of Bacho Kiro in Bulgaria (Kozłowski 2007) and in Italy Uluzzian, after the site of Grotta di Uluzzo, spread in the southcentral parts of the Peninsula and southern Greece. Associated with these assemblages are items of personal decoration in the form of perforated shells, teeth as well as tools made on osseous materials, seen as key elements of cognitive and behavioural modernity (Benazzi et al. 2011; Mussi 2002; Stiner 2010). It has been argued that in the absence of affinities between these traditional industries and the preceding local Mousterian Middle Palaeolithic traditions in the Balkans and Italy, the origin of these Levallois-derived assemblages must be sought in the Near East where comparable examples can be found (Kozłowski 2004; 2007). While it is not easy to assign straightforwardly a taxon to technological traits, the assumption was made that AMH could be associated with these transitional industries, also suggested by the most recent re-evaluation of human remains associated with Uluzzian levels from Grotta del Cavallo, dated to ~45.000 – 43.000 cal BP (Benazzi et al. 2011). It seems that these transitional industries are then followed by the further spread of the typical early Upper Palaeolithic traditions of material culture traits known as Proto-Aurignacian and evolved Aurignacan. One of the typical Aurignacian traits is the appearance of split-base points on antler, which are very abundant at some of the sites, and attest to the innovations in hafting technology (Knecht 1993), which likely related to changes in hunting techniques. Yet, based on recently obtained direct radiocarbon accelerator mass spectrometry (henceforth AMS) dates on Neandertal human remains from Vindija in Croatia, redated to ~33.000 – 32.000 cal BP (Higham et al. 2006), there is an overlap between these dates and those of the Initial/Early Upper Palaeolithic elsewhere (Jöris et al. 2008) raising the possibility for the co-existence of Neandertal and AMH populations in south-eastern Europe.

Further, the importance of the Danube River Basin in the dispersal of AMH across Europe is supported by both early dates for the start of the Upper Palaeolithic in central Europe (from ~42.000 cal BP [Conard/Bolus 2003; Higham et al. 2012]), as well as a number of AMH fossils with early radiocarbon dates along the Danube in the south-western Carpathian Mountains (Soficaru et al. 2006; Soficaru 2007). The earliest dated fossils comprise cranial remains of two individuals from Peștera cu Oase (in the Romanian hinterland of the Danube), which are among the oldest directly dated AMH remains from Europe (Trinkaus et al. 2013; Zilhão et al. 2007; cf. Higham et al. 2011; 2012). In addition, the first traces of Initial/Early Upper Palaeolithic human occupation contemporaneous with the Oase fossils have been found at Tabula Traiana Cave within the Danube Gorges region (Borić et al. 2012). This newly available chronological framework is also supported by the stratigraphic position of tephra levels or the presence of shards from the widespread Campanian Ignimbrite (CI) volcanic eruption dated to ~40.000 cal BP, which originated in the Phlegrean Fields near present-day Naples, representing an important chronostratigraphic marker for various sites across Italy, south-eastern and eastern Europe (Lowe et al. 2012).

Recently re-evaluated evidence for the Palaeolithic occupation of the Danube Basin in the north-central Balkans (Baltean 2011; Bonsall et al. 2012) along with newly discovered and excavated sites (e.g., the site of Šalitrena Cave [Mihailović 2008; Mihailović et al. 2011]) suggests clustering of key Upper Palaeolithic sites in the Sava-Danube River corridors, as important transitory zones where the pace of cultural innovations might have been accelerated due to the intensity of contact and communication that over time resulted in the creation of extended social networks. The assumed rapid spread of Aurignacian industries across Europe suggests that probably natural corridors along river valleys and coasts must have been used. It has been suggested that one of the main Aurignacian routes reaching Italy was along the Sava River valley through the present-day territories of Serbia, Bosnia and Croatia, into the territory of Slovenia, then along the northern Adriatic rim and farther westward along the Po Valley en route to western Europe. Along the route there are important concentrations of sites in the wider catchment of these transitory zones in south-eastern Europe (e.g., Slovenia [Brodar/Osole 1979] and Istria [Balbo 2008; Malez 1979]), farther westwards in coastal Liguria, and generally along the coasts of the Tyrrhenian and Adriatic Seas in Italy (Higham et al. 2009; Mussi 2002). One could see these Aurignacian groups as the earliest examples of extended social networks in Europe.

The evolved Aurignacian industries are generally followed by the Gravettian industries with backed blades and bladelets from ~28.000 cal BP, although in Istria, Croatia (Šandalja II) and the Argolid, Greece (Klisoura Cave 1) the layers with Aurignacian type material might have endured up to ~28.000 BC (Karavanić 2003; Kozłowski 2008; Kuhn et al. 2010). In the eastern Balkans, important sequences documenting these time spans were found in Bulgaria at the sites of Bacho Kiro (Kozłowski 2004 and references therein), Temnata (Kozłowski et al. 1992; Tsanova 2008) and Kozarnika (Guadelli et al. 2008; Tsanova 2008) caves, with indications of gaps between the Aurignacian and Gravettian levels. Stratified Aurignacian and Gravettian levels were also found at the newly discovered site of Šalitrena Cave in the central Balkans, dated to ~24.000 – 25.000 cal BP (Mihailović 2008; Mihailović et al. 2011). With regard to the changing climatic conditions around this time, there were several short interstadial events between 28.000 and 21.000 cal BP while the ice advance accelerated after 25.000 BC, leading to the Last Glacial Maximum (henceforth LGM) (22.000 BP±2000) (Alley et al. 2005). These changes also led to the shrinking of the Adriatic Sea, opening a large land bridge, known as the Great Adriatic Plain, between Italy and the Balkans. It has been argued that the northern Adriatic Plain might have been a zone of high resource productivity (Miracle 2007; but see Mussi 2002, 312). This newly gained territory and the worsening of environmental conditions leading to the LGM might have prompted, at the peak of glacial conditions, actual movements of human populations from the Middle Danube Basin, where well-established Gravettian communities are known (e.g., at Willendorf II, Pavlovian sites), to the areas of southern Europe, with certain parts of the Balkans and Italy, and in particular the Great Adriatic Plain, serving as refugia for both animal, plant and human communities.

While it remains difficult to substantiate the claim about the actual population movement during this period it seems that important influences from the Middle Danube Basin reached both the

Balkans and Italy relating to the spread of techno-morphological traits in lithic types characteristic of the central European Gravettian traditions (Willendorf II layer 9 – Moravany – Banka – Nitra Čerman) (Kozłowski 2008). In particular, in the period following the LGM, from around 23.000 cal BP if not earlier (see below), across the Balkans and Italy one finds a specific typological category known as shouldered piece, which might have related to the development of new hafting techniques, prompted by changes in hunting practices. Shouldered pieces represent an unmistakable techno-functional and stylistic trait that defines the typical early phase of Epigravettian industries, with similarities across the Balkans and Italy (Whallon 1999).

Our research at the site of Vrbička Cave (950 masl) also suggests that in terms of land use strategies, higher altitude locations in the Dinaric Alps started being utilized since the start of the LGM with the documented specialized marmot hunting sites (Borić et al. 2014a; Cristiani 2013; 2014). This is one of the earliest documented examples that testifies to the existence of a long-term evolutionary innovation in land use strategies referred to as broad spectrum economy, i.e. a move from exclusive focus on large game hunting to small game species and in general a wider resource base.

During the Gravettian period, there are examples of raw material transfers over considerable distances. In the eastern Balkans, small quantities of non-local limnoquartzites were transported from the northern parts of the Carpathian Basin to Temnata Cave (Pawlikowski 1992), while possibly similar examples can be found in southern Apulia in Italy (Bietti/Cancellieri 2007). Apart from lithic raw materials, the circulation of marine molluscs, such as *Dentalia*, *Cyclope neritea*, etc., is also attested (Mussi 2002). Such examples may indicate a significant degree of connectivity across these regions over long distances. We will later come back to more detailed examples of these transfers.

The evidence for such connections further increases in the Late Epigravettian phase with general tendencies for the spread of Azilian characteristics and microlithisation in the production of backed points for composite tools. There are further examples of the links between the Danube Gorges Epipalaeolithic sites and various contemporaneous Late Epigravettian sites in Italy (e.g., Cancellieri 2010), which we also explore in some detail below. The presence of Late Epigravettian clay figurines in the Adriatic Basin also suggests possible connections with the tradition found in central Europe (Farbstein et al. 2012). These examples suggest long-distance connectivity across these adjacent regions of southern Europe and beyond at the end of the Pleistocene. The interstadial conditions (Bølling/Allerød oscillations) leading to the melting of glaciers in the Alpine region, prompted a re-colonization of higher altitude locations by human groups in the Italian Alps from ~15.000 cal BP. At this time in the Prealps, similarly to earlier examples from the Balkans, some of these groups start focusing on marmot hunting, with several specialized sites identified to date (Romandini et al. 2012).

The start of the Holocene along with the amelioration of environmental conditions after ~11.600 cal BP, brought about the recovery of plant communities across these regions, fostering the growth of dense vegetation coverage (Willis 1994). The inundation of the Great Adriatic Plain and various other coastal regions took place due to the onset of rapid late glacial warming from ~15.000 cal BP, causing the rise of sea levels. It has been argued that these developments significantly affected long distance connections across the Balkans and Italy and led to a relative insularity of foraging communities in both regions in the course of the Early Mesolithic (~11.600–9200 cal BP). Such changes must have considerably affected the territorial organization of Late Epigravettian groups (Whallon 2007a). Evidence of Early Holocene adaptations have been found in the Danube Gorges (Bonsall 2008; Borić 2011), Montenegro (Mihailović 2007), southern Greece (Kozłowski/Kaczanowska 2009), Thessaly (Kyparissi-Apostolika 2003), Istria (Miracle 1997) and on Adriatic islands, while the period is much better researched and known in Italy (Mussi 2002 and references therein). Some have suggested a process of regionalization, with little evidence of long distance contacts, leading to socially 'closed' societies in the Early Mesolithic (Mihailović 2007). It also seems that distinct cultural/stylistic territories were established, on the one hand, in Italy and along the eastern Adriatic coast with the chronological succession of the Sauveterrian (Early Mesolithic) and Castelnovian (Late Mesolithic) techno-complexes, and, on the other, the hinterland regions of the Balkans characterized by the continuation of Epigravettian traditions (Kozłowski/Kaczanowska 2009). Yet, there are well-documented examples of long-distance exchanges of symbolic items, such as marine shells, between the deep hinterland areas such as the Danube Gorges and various coastal regions along the Adriatic (Cristiani/Borić 2012), re-emphasizing the importance of riparian corridors (e.g., Borić 2011; Floss 2014). There is also evidence for a considerable increase in the use of osseous materials and the development of specific artefact forms, such as harpoons, across both regions.

This short overview has highlighted key developments across the Balkans and Italy in the course of early prehistory and it reveals the potential of the proposed undertaking, which aims to explore two adjacent regions of southern Europe in which both climatic/environmental and sociocultural factors might have affected patterns of social organization of hunter-gatherer groups over millennia. This represents a largely untapped resource, as our current knowledge of these periods remains hampered by various preservation and research biases (especially in the Balkans). In the following, we provide more specific examples of connectivity between the Balkans and Italy in the course of the Upper Palaeolithic and Mesolithic.

Shouldered Pieces

As previously mentioned, one particular technological innovation in knapped stone assemblages that appeared in the course of the Upper Palaeolithic of both the Balkans and Italy are shouldered pieces (*fig. 1*). These are most frequently points (*pointes à cran*), but other tool morphologies (e.g., blades) are also found with recognizably tapered and retouched bases used for hafting. The appearance of this innovation has often been associated with the Early Epigravettian period in the Balkans and Italy. It has been assumed that this innovation spread from Gravettian cultures of central Europe, possibly even as part of actual population movements from central Europe into southern European refugia at the time of the worsening of climatic conditions in the course of the LGM. Such processes might have led to the patterning of archaeological evidence that is referred to as 'the shouldered point horizon' (Kozłowski 2008, 9). This tool type represents an important fossil directeur for the period in these regions (*fig. 2*). Importantly, this innovation is linked to changes in hunting practices, with the introduction of different hafting technological solutions for fixing arrows on thinner shafts and allow for lighter and well balanced projectiles, arguably easier to produce than those with centrally placed stems, which are more fragile. Such projectiles, used either with bows or spear-throwers, allowed for the targeting of prey at larger distances (Plisson/Geneste 1989).

In northern Italy, industries with *à cran* pieces have been found at Grotta delle Arene Candide and Grotta dei Fanciulli in Liguria (Laplace 1964; 1966) and at Grotta Paina in Veneto (Broglio et al. 1993). In the south-eastern part of the peninsula the key sequence is the site of Grotta Paglicci in Puglia, which has yielded the most complete Epigravettian stratigraphic sequence for the wider Adriatic region (Mezzena/Palma di Cesnola 1967). At Grotta Paglicci, shouldered pieces are found in Early Epigravettian layers (from layer 18 to 10). The presence of shouldered pieces is also attested in the caves of Taurisano (Bietti 1979), Mura and Cipolliane in Salento, Grotta Niscemi and Canicattini Bagni in Sicily, and Riparo del Romito in Calabria. This widespread distribution suggests that shouldered pieces are well established in all southern regions of Italy. Early Epigravettian cave settlements are known also in the Apennine Mountains, in Marche and Abruzzo regions. Shouldered pieces are also found at the sites of Cavernette Falische (Mussi/Zampetti 1985), Grotta del Sambuco (Barra Incardona 1969), Cenciano Diruto (Pennacchioni/Tozzi 1984), and Grotta delle Settecannelle (Ucelli Gnesutta/Cristiani 2014 and references therein) in Lazio.

Some of the earliest sites with shouldered points in the Balkans are found in Istria, Croatia (Šandalja II with a date of 21.740±450 BP, Malez 1979), Ovčja Jama in Slovenia (layers 3 and 4 with the date of 19.540±500 BP, Osole 1962/1963) and Kastritsa in western Greece (level 19 with the date of 19.900±370 BP, Bailey/Gamble 1990). Recent research at Vrbička Cave in western Monte-

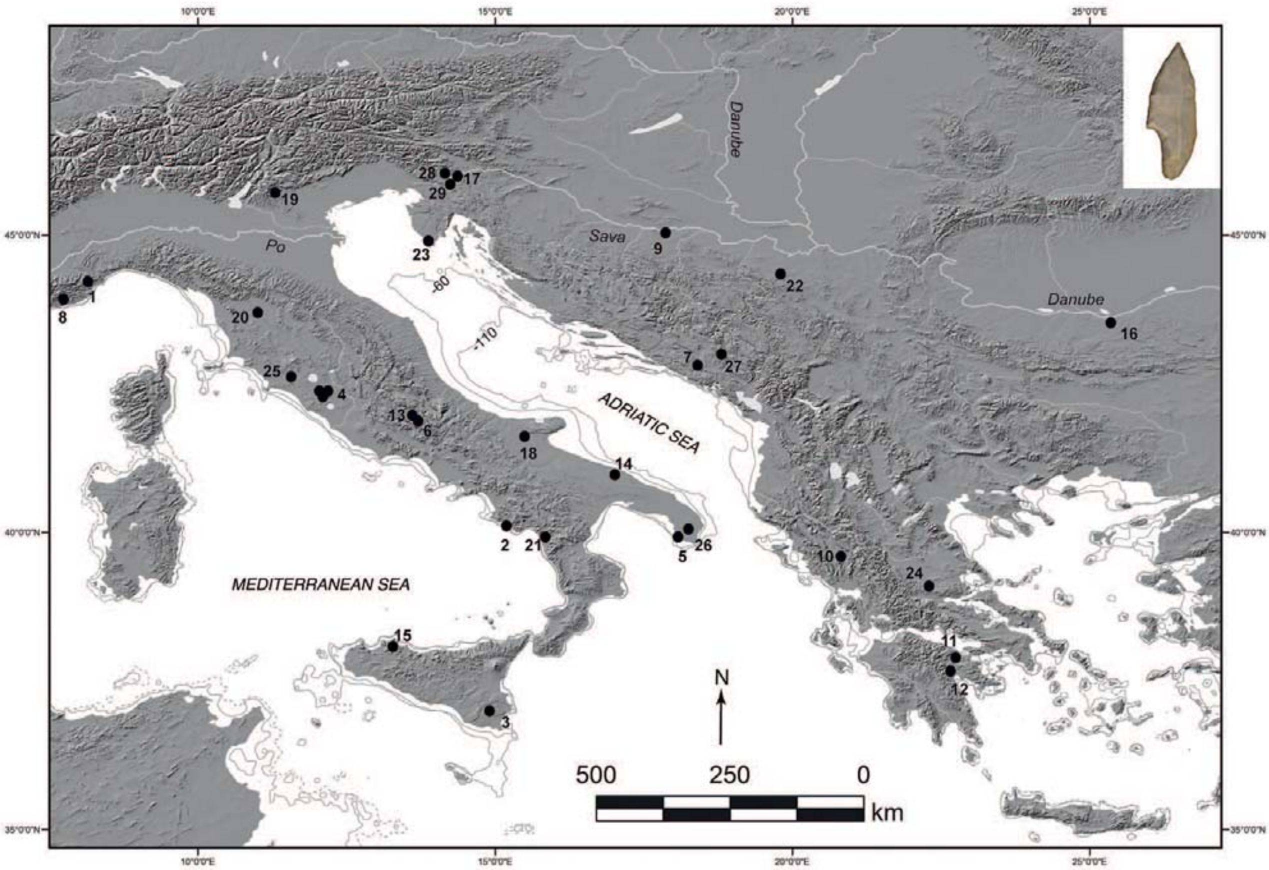

Fig. 1. Map showing the distribution of sites with shouldered points in the Balkans and Italy. Bathymetric contours show the drop of sea levels –110m during the LGM climax and –60m by the end of the Pleistocene.
1. Arene Candide; 2. Cala della Ossa; 3. Canicattini Bagni; 4. Cavernette Falische (Cenciano Diruto, Lattanzi, Sambuco); 5. Cipolliane C; 6. Clemente Tronci; 7. Crvena Stijena, layer IX; 8. Fanciulli; 9. Kadar; 10. Kastritsa; 11. Kephalari; 12. Klissoura 1, layer IIb; 13. Maurizio; 14. Mura; 15. Niscemi; 16. Orphei (Tchoutchoura); 17. Ovčja Jama; 18. Paglicci; 19. Paina; 20. Poggio alla Malva; 21. Romito; 22. Šalitrena; 23. Šandalja II; 24. Seidi; 25. Settecannelle; 26. Taurisano; 27. Vrbička; 28. Zakajeni spodmol; 29. Županov spodmol.

negro reports one shouldered blade piece. This might currently be the earliest dated occurrence of shouldered pieces in the Balkans as the layer in which it was found is AMS-dated to 23.120±160 BP (OxA-27861), which calibrates to around 28.000–27.000 cal BP (Borić et al. 2014a; Cristiani 2013; 2014), pushing the occurrence of this tool type in the Balkans to the Gravettian period in the context of the earliest backed industries of the region. Two shouldered pieces have also been found in the Gravettian levels of Šalitrena Cave in western Serbia and are said to date to the period 25.000–24.000 cal BP (Mihailović 2008; Mihailović et al. 2011, 89) but the actual dates from this site have not been published yet.

Currently, there remains a need to better understand the occurrence of the 'horizon with shouldered points' across the Balkans and Italy along with a need to establish a more accurate chronological scale for the appearance of this *fossil directeur* in these two regions and determine likely links with the industries in the Middle Danube Basin. It has been suggested that it was the actual population movement into southern European refugia during the LGM that allowed for the spread of innovations in the form of shouldered pieces. An alternative or complementary explanation could be that the spread of this particular hafting innovation as a possible improvement in hunting techniques was part of knowledge transfers that were enabled by the existence of well-connected social networks that might have in part been prompted by the worsening of the climatic conditions with the onset of the LGM. One could envisage that the frequency of 'arrhythmic' processes of population contraction and disper-

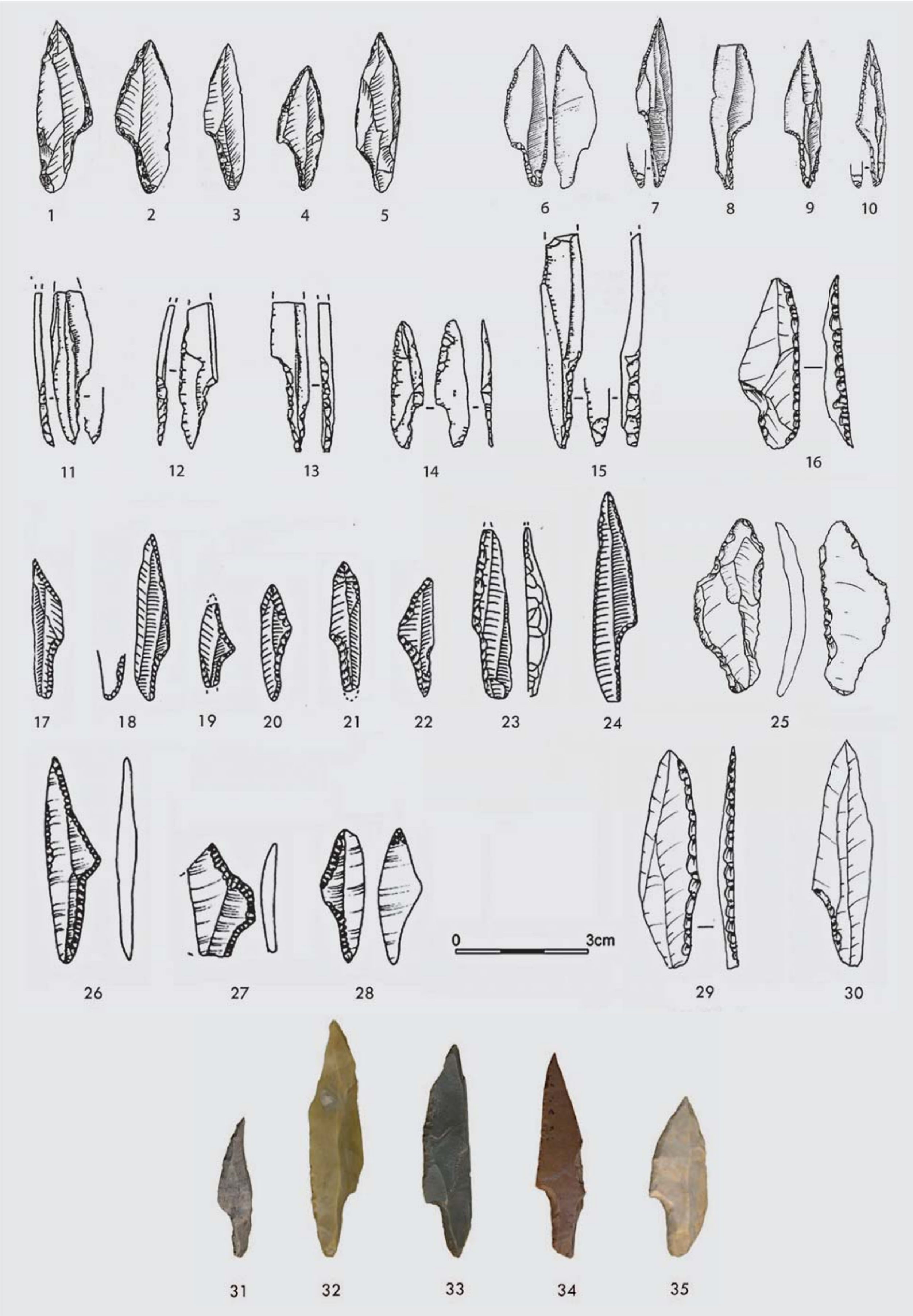

Fig. 2. A selection of shouldered points from various Gravettian/Epigravettian sites in Italy and the Balkans.
1 – 5. Settecannelle; 6 – 10. Paglicci; 11 – 15. Paina; 16. Crvena Stijena; 17 – 18. Šandalja; 19 – 22. Kadar; 23 – 24. Kastritsa; 25. Vrbička; 26 – 28. Orphei; 29 – 30. Šalitrena; 31 – 35. Settecannelle.

sal across these regions during the Gravettian and Early Epigravettian periods might have in part contributed to the need for reliable social networks across long distances with transferability of knowledge and know-hows between forager groups. In this context, the emergence and spread of a particular technological innovation is only an epiphenomenon of social arrangements that were at this time already in place beyond the territories of the adjacent regional bands.

Decorative Motifs

In the Late Epigravettian period, very similar geometric decorative motifs occur contemporaneously at sites separated by hundreds of kilometres in the Balkans and Italy (*fig. 3*). In Italy, the Epigravettian layers of Grotta delle Settecannelle in Lazio have yielded a rich assemblage of portable art, comprising more than 50 incised objects of stone, bone, and antler, some of which are tools. The stratigraphy of Settecannelle spans the period from the Early Epigravettian, characterised by the presence of an *à cran* phase to the Final Epigravettian characterized by an industry dominated by short thumbnail-shaped scrapers of the Romanellian type (Boschian/Ucelli Gnesutta 1995). The chronology of the human occupation at the cave has been based on dates on charcoal from a sequence of hearths. There are seven charcoal dates that cover the Epigravettian period (*tab. 2*). In *fig. 4*, calibrated ranges of these dates are compared to North Greenland (NGRIP) $\delta^{18}O_{ice}$ record and event stratigraphy. Despite a necessary caution regarding the limited number of dates and relatively imprecise conventional charcoal measurements, it is probable that the occupation of layer 10 dated with three radiocarbon measurements relates to the early phase of the Bølling/Allerød interstadial, i.e. the period between ca. 15.650 and 13.490 cal BP (95% confidence). Layer 8 is dated with one charcoal date only that calibrates to the range 13.030 to 11.760 cal BP (95% confidence), which falls into the duration of the Younger Dryas cold spell.

Examples of portable art come from two Final Epigravettian levels: layers 10 and 8. Stone pebbles were in a number of instances incised with 'naturalistic' depictions of aurochs. These layers also yielded incised bones with 'structured geometric style' and artefacts with 'repetitive incisions'. One black-burnt bone object bore parallel rectilinear incisions in combination with a zig-zag motif (*fig. 5*). The decoration extends on the whole surface leaving free only the central part. In this zone, a microscopic examination revealed that a grid of straight lines was traced at first in order to follow a preconceived decorative pattern for the rectilinear motif. Three abstract motives are represented on the bone: a meander, an angular band, and a broken line. The meander is developed along the fractured edge and is incomplete. The preserved part is constituted of five parallel lines each very close to the other. The external line is deep and we can hypothesize that another similar line would have completed the drawing in the missing part. The angular band is a band of six lines, which form a 90-degree angle. Below this, the four central lines close in pairs of two while the two external lines open on the left and the right and frame a segment of the broken line (Ucelli Gnesutta/Cristiani 2002).

Comparisons regarding the style of both naturalistic and geometric depictions can be made with other contemporaneous Palaeolithic sites in Italy, such as meandric motives found in Grotta Polesini

Layer	Context	Lab ID	Material	^{14}C (uncal. BP)
8	hearth	GrN-15977	Charcoal	10570±260
10	hearth	OZC-164	Charcoal	12050±150
10	hearth	GrN-21847	Charcoal	12540±100
10	hearth	OZC-163	Charcoal	12700±170
14–12	hearth	OZC-165	Charcoal	15700±180
16	hearth	OZC-166	Charcoal	16200±200
17	hearth	GrN-21848	Charcoal	16620±210

Tab. 2. Existing charcoal dates from Grotta delle Settecannelle (after Ucelli Gnesutta/Cristiani 2002, footnote 1).

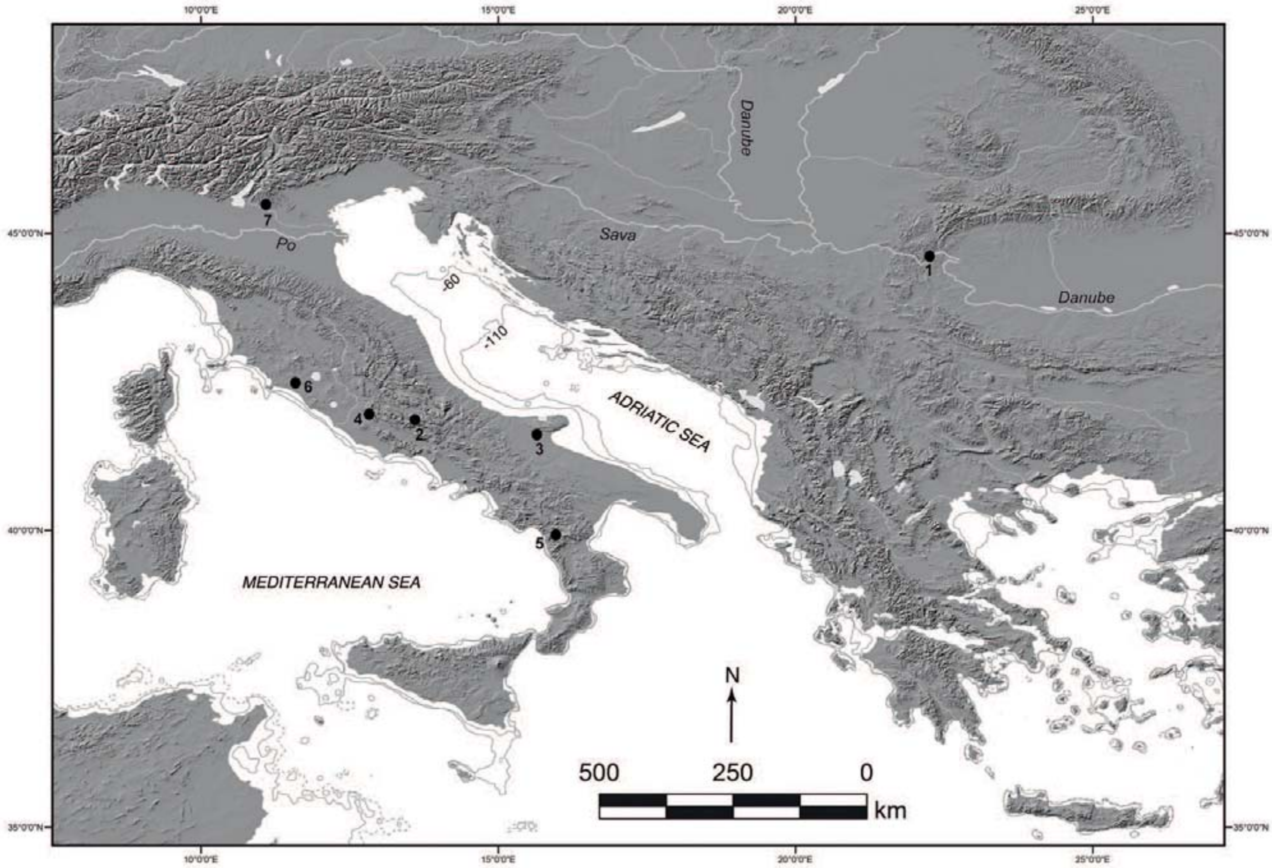

Fig. 3. Map showing the distribution of sites with Epigravettian engraved motifs in the Balkans and Italy. Bathymetric contours show the drop of sea levels –110m during the LGM climax and –60m by the end of the Pleistocene.
1. Cuina Turcului; 2. Fucino caves; 3. Paglicci; 4. Polesini; 5. Romito; 6. Settecannelle; 7. Tagliente.

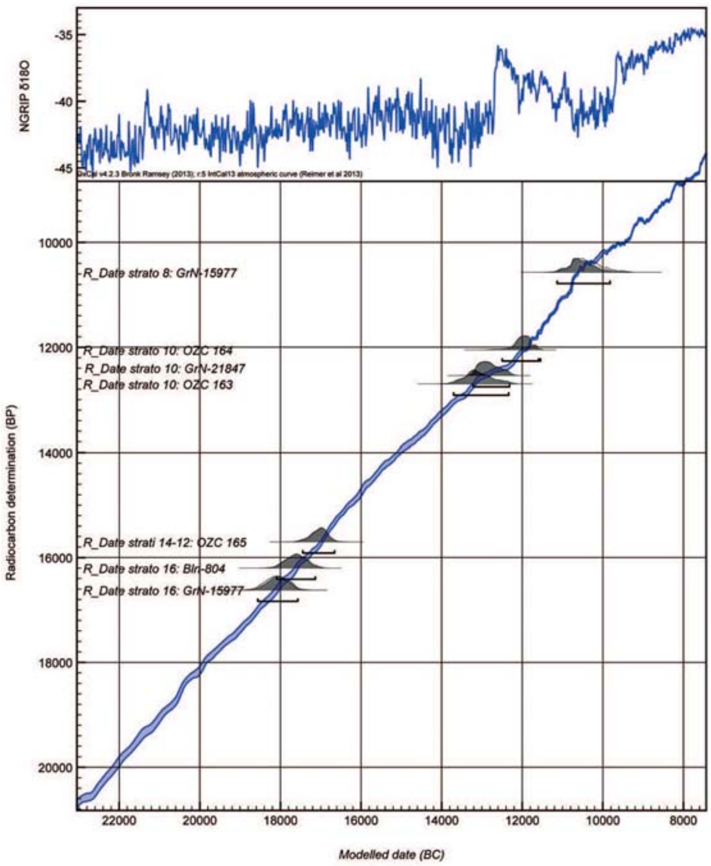

Fig. 4. Calibrated radiocarbon ranges from Epigravettian levels of Grotta delle Settecannelle. Dates are calibrated using OxCal v4.2.3 (Bronk Ramsey et al. 2013) and the IntCal09 dataset (Reimer et al. 2013); compared to North Greenland (NGRIP) $\delta^{18}O_{ice}$ record and event stratigraphy.

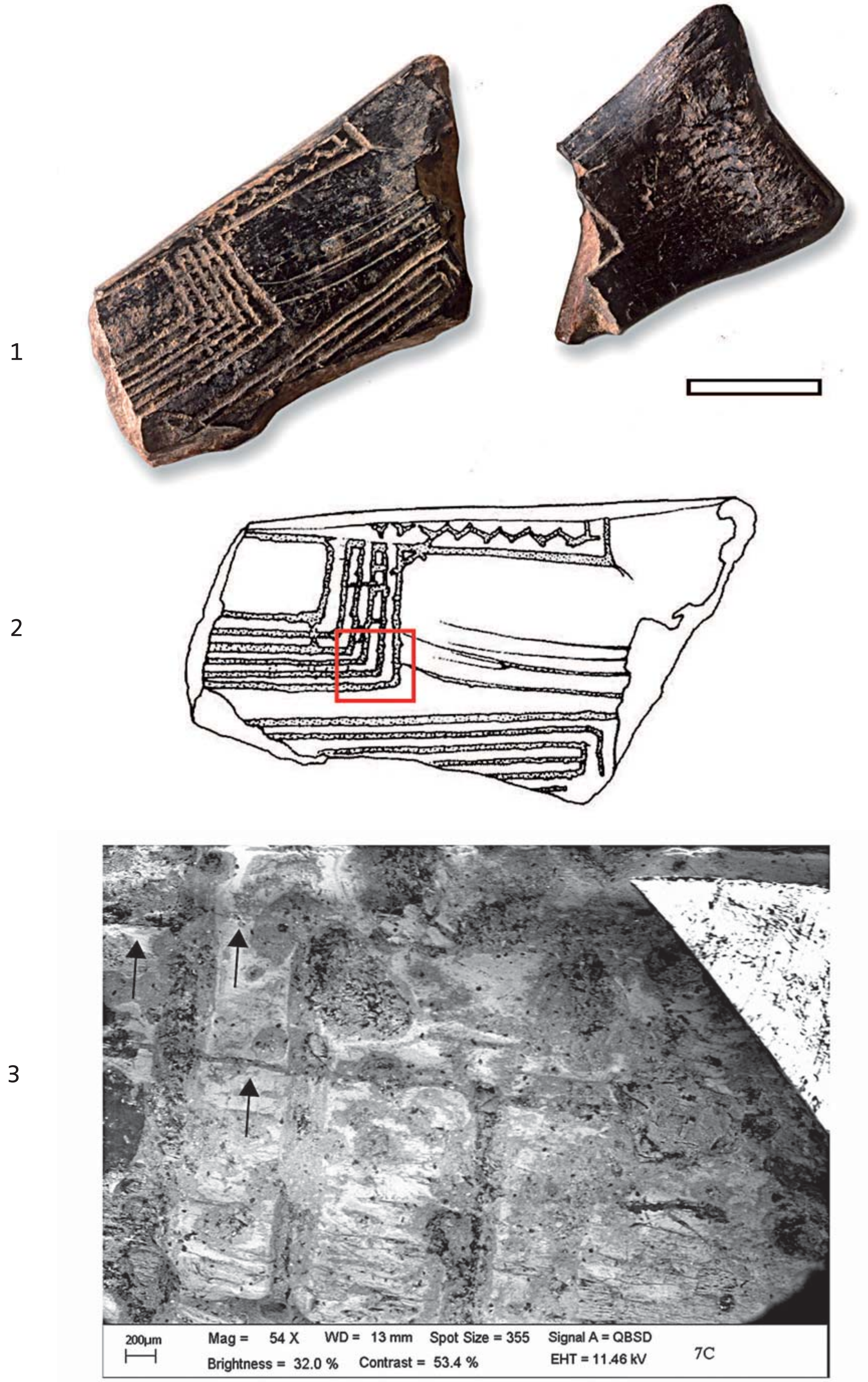

Fig. 5. Decorated bone from Settecannelle, layer 8, Lazio, Italy (after Ucelli Gnesutta/Cristiani 2002).

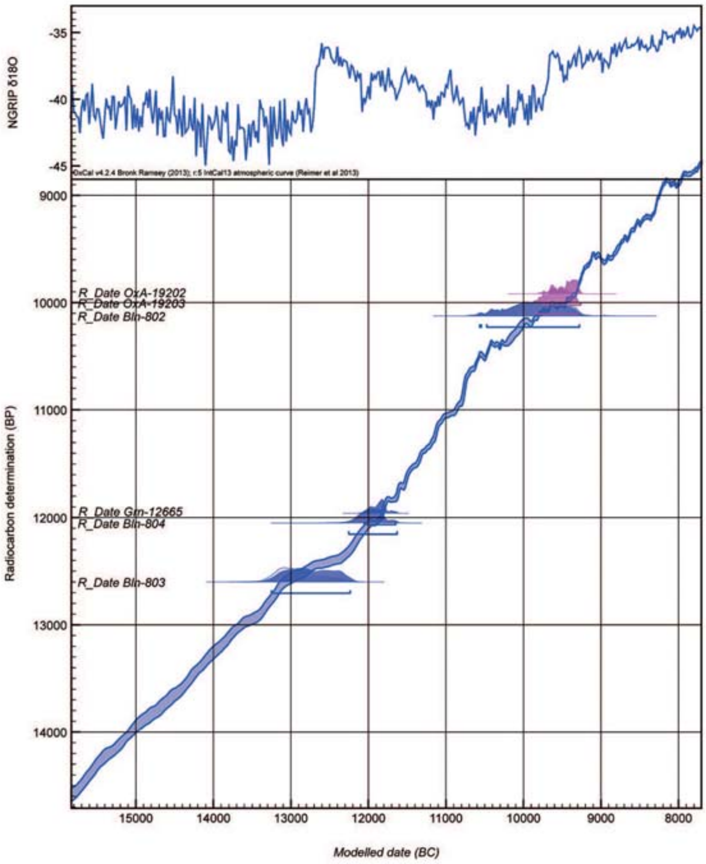

Fig. 6. Calibrated radiocarbon ranges from Epigravettian levels of Cuina Turcului. Dates are calibrated using OxCal v4.2.3 (Bronk Ramsey et al. 2013) and the IntCal09 dataset (Reimer et al. 2013); compared to North Greenland (NGRIP) $\delta^{18}O_{ice}$ record and event stratigraphy.

in Lazio, Riparo Tagliente in Veneto, Fucino caves in Abruzzo, Grotta Paglicci in Apulia (Arrighi et al. 2008; Arrighi 2012), Riparo del Romito in Calabria (Graziosi 1973; Grifoni Cremonesi 1998). At these sites, both naturalistic incised animal depictions and geometric designs on portable objects are found, and both categories of ornamented objects are similar to those found at Settecannelle.

Farther afield, the style of incisions found at Settecannelle can also be associated with the iconography found at the site of Cuina Turcului in the Danube Gorges area of present-day Romania (Mărgărit 2008; Păunescu 1970). Four charcoal dates come from Cuina Turcului layers I and II and the more recent AMS dates from layer II date human remains (*tab. 3; fig. 6*). A similar caution expressed about a limited number of charcoal dates from Settecannelle must apply here too. Layer I is dated with three dates that fall into the early phase of the Bølling/Allerød interstadial. The calibrated ranges of these three measurements are between 15.280 and 13.590 cal BP (95% confidence). Compared to the dates from Settecannelle, there is contemporaneity between the occupations of these Final Epigravettian layers where decorative motifs appear at the two sites.

Epipaleolithic layers I and II at Cuina Turcului yielded several art objects with geometric motives (*fig. 7*) very similar to those found in the Final Epigravettian layers of Settecannelle. Apart from zig-zag lines found on a number of incised osseous objects, one bone object from layer I bears similar identical parallel meander-like lines to those found at Settecannelle.

Similarities between the Epigravettian levels of Cuina Turcului and Climente II in the Danube Gorges and Settecannelle are also found in their respective lithic industries, and include the presence of backed curved points and numerous circular thumbnail scrapers, backed blades and double backed blades with inverse proximal retouch (Chirica 1999). These techno-morphological traits are common for the Tardiglacial lithic industries across the central-eastern Mediterranean regions: southern France, Italy, and the Balkans (Broglio/Kozłowski 1987; Kozłowski 1999). In addition, a similar range of ornamental beads made of marine gastropods, in particular *Cyclope neritea* (see

Layer	Context	Lab ID	Material, species	$\delta^{13}C$	$\delta^{15}N$	^{14}C (uncal. BP)
II	"Individual 1," adult female, left humerus	OxA-19203	Bone, *Homo sapiens*	−19.4	15.2	10.435±45 (uncorrected) 10.003±71 (corrected)
II	"Individual 2" (687), adult male?, 25-35 yr, left ulna	OxA-19202	Bone, *Homo sapiens*	−19.3	15.2	10.350±45 (uncorrected) 9918±71 (corrected)
II	depth 3.68–3.85 m, hearth at the base of the layer	Bln-802	Charcoal, Pinus sp.	–	–	10.125±200
I	depth 6.2–6.4 m, hearth at the base of the layer	GrN-12665	Charcoal, Pinus sp.	–	–	11.960±60
I	depth 6.2–6.4 m, hearth at the base of the layer	Bln-804	Charcoal, Pinus sp.	–	–	12.050±120
I	depth 5.9 – 5.95 m	Bln-803	Charcoal, Pinus sp.	–	–	12.600±120

Tab. 3. Charcoal and AMS dates from Cuina Turcului (corrected and uncorrected values are given for the OxA- AMS dates after Bonsall et al. 2015, tab. 2; Bln- and GrN- dates after Păunescu 2000, 342).

below), as well as red deer canines were used at these two distant and broadly contemporaneous Late Epigravettian sites.

While some of these similarities between these regions must have stemmed from older shared cultural repertoires and can be interpreted as a consequence of branching cultural processes, striking similarities in decorative motifs used around the same time can hardly be explained by convergent and independent innovations in these two distant regions. The distance between Settecannelle and Cuina Turcului is around 900 km as the crow flies and certainly longer taking into account geographic and other limitations and difficulties in traveling. In our opinion, the observed similarities could better be explained by long-distance connections along established social networks beyond adjacent maximal/regional band territories. During the periods in question, either during the Bølling/Allerød interstadial or in the course of the Younger Dryas, one should envisage relatively open and in places sparsely forested landscapes. It should be noted, however, that based on more recent syntheses of the pollen data, and additional direct dating of macro-charcoal remains of identified tree species, during the glacial periods, south-eastern European landscapes were not steppe lands as previously thought. Around 40% of the total pollen comes from coniferous, needle-leaved tree types, such as pine (*Pinus*). But there is also good evidence of the refugial survival of deciduous, broad-leaved species of trees, such as oak (*Quercus*) and hazel (*Corylus*), as small pockets in predominantly coniferous forests. In addition, south-facing slopes might have also preserved deciduous tree species. In particular, mid-altitude, mountainous locations with higher levels of precipitation might have been favourable for the survival of forests, with low altitude locations being too dry and high altitude locations being too cold (Willis 1994; 1996; Willis/van Andel 2004). All the same, traversing long distances across Tardiglacial landscapes of southern Europe might have been a considerably easier task than during the Early Holocene.

In addition, the lower sea levels in the Adriatic might have still allowed a short-cut communicative route from the Balkan hinterland when traversing across the northern half of the Great Adriatic Plain into Italy. These environmental and geographic factors, coupled with the need to maintain long-distance contacts, perhaps partly as safe-

Fig. 7. Decorated bones from Epigravettian levels at Cuina Turcului, the Danube Gorges, Romania (after Mărgărit 2008, fig. 81; Păunescu 1970).
1. ornamented equid phalanx, layer II; 2 – 4. ornamented bones, layer I.

ty nets in unpredictable and harsh climatic conditions among small-world societies (see above), could be a possible way to explain the existence of such long-distance connections during this period. But, as previously emphasized, connectivity need not be interpreted as stemming out of utilitarian and rational motivations only. Admittedly, the chronological scale and relatively crude palaeoenvironmental proxies when comparing the temporal placement of decorative motifs from the two sites, Settecannelle and Cuina Turcului, remain coarse-grained, with a number of uncertainties regarding a detailed reconstruction of the context of the assumed interactions between the two distant regions. Future improvements of the chronological and palaeoenvironmental frameworks would allow one to make firmer conclusions when attempting to reconstruct the shape and density of late Epigravettian social networks across Italy and the Balkans.

Ornamental Beads

For a good reason, ornamental beads often play an important role in discussions about long-distance exchanges between different communities. Ornamental beads can be understood both as a powerful material objectification with symbolic connotations and an important element of visual information technologies due to their easy transferability and standardisation qualities (e.g., Kuhn/Stiner 2007; d'Errico/Vanhaeren 2007; Vanhaeren/d'Errico 2006; White 2007). Based on the long and continuous Palaeolithic to Mesolithic sequence at Franchthi Cave in Greece, recently Perlès (2013, 296) has argued that ornamental traditions could be understood as reflections of long-term regional continuities rather than a reflection of changes related to population replacements or social boundaries, and may operate on different scales of change from other categories of material culture (e.g., lithics). For instance, at Franchthi, ornaments show a remarkable stability over the long-term and, different from lithics, a limited spectrum of types was selected, with the predominance of *Cyclope* sp., *Columbella rustica* and *Dentalium* sp. shells, while perforated teeth and bone ornaments are absent. Yet, on the medium-term scale and at a more detailed typological level, Perlès defines different phases in the ornamental assemblage, with *Homalopoma sanguineum* characterizing both the Aurignacian and Gravettian ornamental phases, *C. rustica* being common in the Epigravettian phase and the appearance of perforated pebbles in association with the Mesolithic (Perlès 2013, 287). Remarkably, no changes in the repertoire of ornaments used are recognized in the transition from the Aurignacian to the Gravettian and, later, from the Epigravettian to the Mesolithic, although a replacement of population was suggested in both cases based on changes in the characteristics of lithic assemblages.

Beads made of *Cyclope neritea* gastropods represent one of the oldest types of ornamental beads used since the beginnings of the Upper Palaeolithic in both the Balkans and Italy (*figs. 8–9*). Examples from Franchthi (Douka et al. 2011) and Klissoura (Stiner 2010) caves in Greece show that *C. neritea* ornamental beads were found starting from the transitional (Uluzzian) and the earliest Upper Palaeolithic levels first in costal zones that were in the relative vicinity of the natural habitats of this species. Similarly, a relative proximity of archaeological *C. neritea* beads to the natural habitat of the species can be claimed in the case of a small number of ornaments made of this gastropod associated with the late Upper Palaeolithic levels at the sites of Vela Spila on the island of Korčula (Cristiani et al. 2014a) and Vlakno Cave on the Dugi Otok island (Vujević/Parica 2009/2010), both in Croatia. At these two sites, several *C. rustica* beads appeared at this time too while their popularity peaks in the course of the Mesolithic (see below). On the other hand, in the Balkans, the earliest currently known example of the spread of this type of beads into the hinterland over a considerable distance of more than 400 km relates to their appearance in the previously discussed Epigravettian levels at the site of Cuina Turculi in the Danube Gorges region of Romania (Mărgărit 2008, fig. 81; Păunescu 1970). As the crow flies, the distance of the Danube Gorges region to the Black Sea along the Danube is ca. 500 km, the shortest route to the southern Adriatic Sea is ca. 400 km, and to the northern Aegean Sea ca. 500 km.

In Italy, *C. neritea* beads were found, among other sites, in occupation deposits of Riparo Mochi

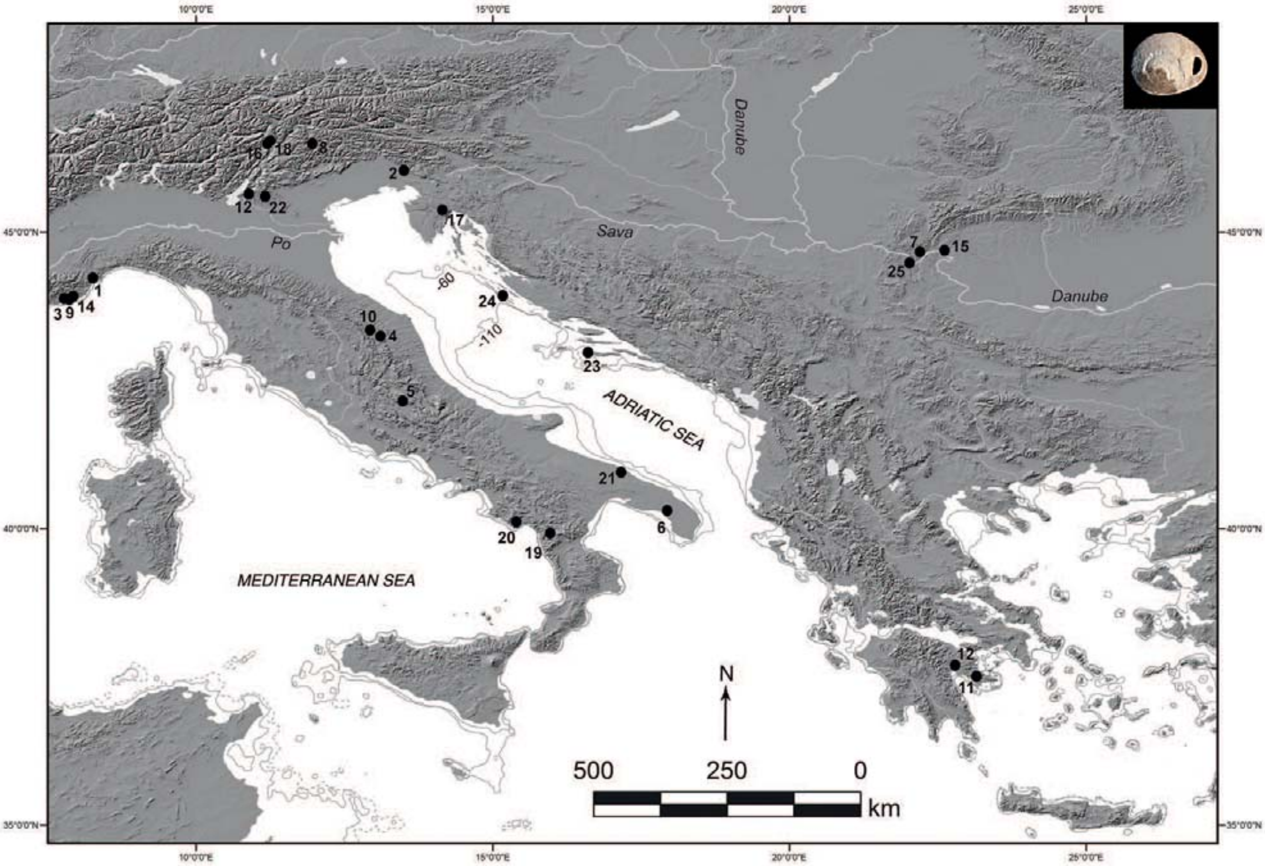

Fig. 8. Map showing the distribution of Upper Palaeolithic and Mesolithic sites with *Cyclope neritea*, ornamental beads in the Balkans and Italy. Bathymetric contours show the drop of sea levels –110m during the LGM climax and –60m by the end of the Pleistocene.
1. Arene Candide; 2. Biarzo; 3. Bombrini; 4. Continentza; 5. Continenza; 6. Cavallo; 7. Cuina Turcului; 8. Dalmeri; 9. Fanciulli; 10. Ferrovia; 11. Franchthi; 12. Fumane; 13. Klissoura 1; 14. Mochi; 15. Ostrovul Banului; 16. Pradestel; 17. Pupićina; 18. Romagnano III; 19. Romito; 20. Serratura; 21. S. Maria di Agnano; 22. Tagliente; 23. Vela Spila; 24. Vlakno; 25. Vlasac.

in the Balzi Rossi (Stiner 1999a), Grotta di Fumane (Fiocchi 1997), Riparo Tagliente (Gurioli 2006), and Biarzo (Cristiani 2013). At S. Maria di Agnano in Puglia, *C. neritea* ornaments were found associated with a Gravettian female burial (Giacobini 2006, 173; Vacca/Coppola 1993). The most notable examples are Late Epigravettian burials of two children (two and four years old) from Grotta dei Fanciulli, Liguria, with more than 1426 *C. neritea* shell ornaments found on the back of the deceased, underneath the pelvic bones (Vanhaeren/d'Errico 2003). These burials are dated to a late phase of the Epigravettian (Henry-Gambier et al. 2001). In the same region, at Arene Candide, the Gravettian burial Prince and several other Epigravettian burials were adorned by different marine shell beads, among which were also very numerous *C. neritea* (Cardini 1980). At La Madeleine, in the Dordogne region, France, an infant was buried with hundreds of Dentalium and several *C. neritea* shell beads, and is dated to the Epipalaeolithic (Azilian) (Vanhaeren/d'Errico 2001; 2003).

This apparent popularity of *C. neritea* beads seems to have peaked primarily in Italy but also in the Balkans around the same time in the course of the Epigravettian period. This corresponds well with the previous discussion of decorative motifs that suggested long-distance connections between certain regions of Italy and the Balkans in the Late Upper Palaeolithic. On the other hand, some other Upper Palaeolithic sites in the Balkan hinterlands yielded only evidence of Dentalium shell ornaments, such as Gravettian levels at the site of Šalitrena Cave in Serbia (Mihailović 2007) and Badanj Rockshelter in Herzegowina (Whallon 2007b). Differently, at Mališina Stijena Rockshelter in northern Montenegro, two perforated specimens of *Nassarius gibbosulus* were found in Late

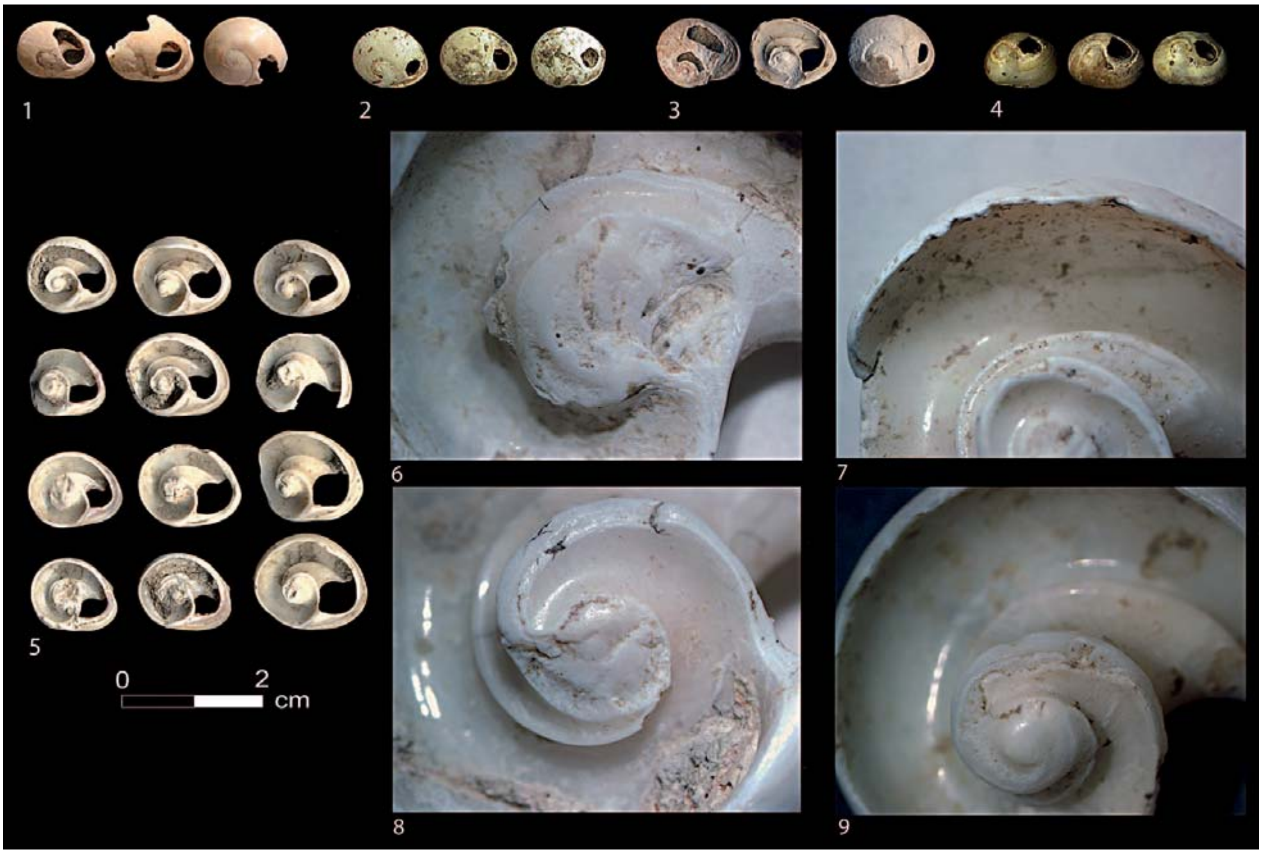

Fig. 9. A selection of *Cyclope neritea* ornamental beads found in Italy and the Balkans.
1. Biarzo; 2. Tagliente; 3. Vela Spila; 4. Mochi; 5 – 9. Vlasac.

Epigravettian layer 2 (Bogićević/Dimitrijević 2004; Radovanović 1986). *Nassarius* was also found at Vela Spila (Cristiani et al. 2014a). Closer to the Adriatic coastal zone, one also finds Glycimeris shells in Gravettian/Epigravettian levels at Crvena Stijena Rockshelter in Montenegro and Vlakno Cave on Dugi Otok island in Croatia (Vujević/Parica 2009/2010). In addition, beads made from red deer vestigial canines remain popular for the most of this period and were found at a number of sites.

During the Early and Middle Mesolithic (ca. 11.500 – 9300 cal BP), *C. neritea* beads disappeared from the archaeological record of the Mesolithic sites in the Danube Gorges region of the Balkans (Borić 2011) and Italy (Mussi 2002). In this region, ornamental beads have neither been associated with burials dated to these earlier Mesolithic phases nor with Early-Middle Mesolithic occupation levels. While this could be a reflection of a relatively patchy preservation and devastation of these levels at sites that were repeatedly used in later Mesolithic and Neolithic phases, it could also be a genuine pattern of evidence that points to diachronic changes in connectivity and consumption of ornamental beads. Similarly, major changes in the circulation of good quality flint raw materials coupled with concomitant technological choices in the Balkans with the onset of the Holocene have been interpreted as the consequence of 'the increasing forestation which blocked the access to some primary deposits, and … the increasing isolation of human groups in the Early Holocene' (Kozłowski/Kozłowski 1982, 100; cf. Mihailović 2007). Indeed, at the start of the Holocene across the Balkans mixed deciduous woodland expanded quickly, showing overall similarities across the region in tree species composition, dominated by oak (*Quercus*), hazel (*Corylus*), lime (*Tilia*), and elm (*Ulmus*) (Willis 1994). At present, available data for these earlier Mesolithic phases in the Danube Gorges and other hinterland regions in the Balkans remain too limited for a more unequivocal answer regarding the character of connectivity between coastal and inland foragers.

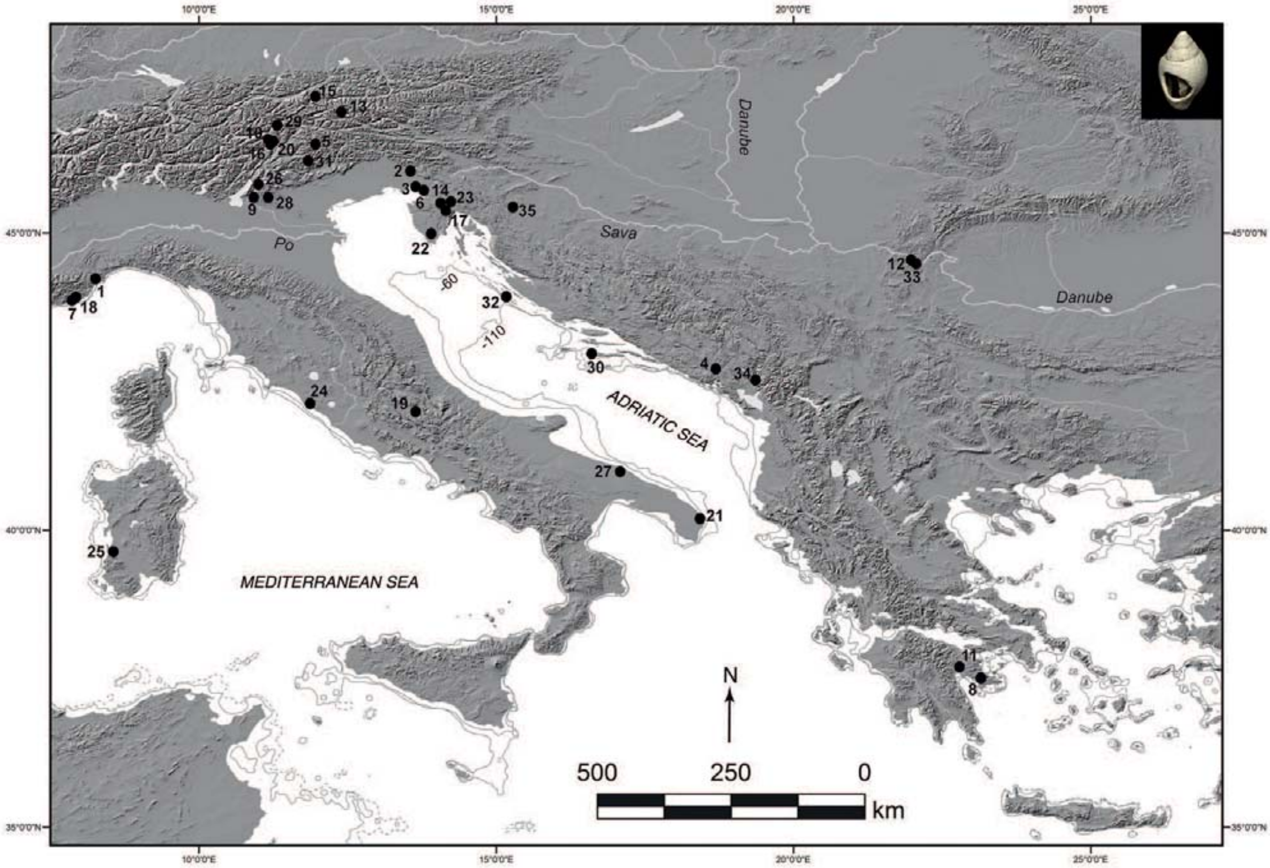

Fig. 10. Map showing the distribution of Epigravettian and Mesolithic sites with *Columbella rustica* ornamental beads in the Balkans and Italy. Bathymetric contours show the drop of sea levels –110m during the LGM climax and –60m by the end of the Pleistocene.
1. Arene Candide; 2. Biarzo; 3. Ciclami; 4. Crvena stijena; 5. Dalmeri; 6. Edera; 7. Fanciulli; 8. Franchthi; 9. Fumane; 10. Gaban; 11. Klissoura1; 12. Lepenski Vir; 13. Mondeval de Sora; 14. Ovčja; 15. Plan de Frea; 16. Pradestel; 17. Pupićina; 18. Mochi; 19. Pozzo; 20. Romagnano III; 21. Romanelli; 22. Šandalja II; 23. Šebrn; 24. Settecennelle; 25. S'Omu e S'Orku; 26. Soman; 27. S. Maria di Agnano; 28. Tagliente; 29. Vatte di Zambana; 30. Vela Spila; 31. Villabruna; 32. Vlakno; 33. Vlasac; 34. Vruća; 35. Zala.

There seems to have been an important change with the start of the Late Mesolithic in the Balkans, from around 9300 cal BP. The extent of long-distance connectivity is perhaps again best inferred on the basis of the presence of 'exotic' ornaments in the Danube Gorges region. The Late Mesolithic deposits at the site of Vlasac yielded evidence of *C. rustica* beads in association with inhumation Burial 49 (Borić 2011, 171 and references therein). In this context, it is particularly significant that Burial 49, one of only two nonlocal individuals at this site on the basis of strontium isotope analysis (Borić/Price 2013), is the only Late Mesolithic individual at Vlasac that was associated with eleven *C. rustica* beads, and may suggest that this possible female originated in areas outside the Danube Gorges, perhaps even from one of the mentioned coastal regions. At Vlasac, *C. rustica* beads were also found in the occupation deposits dated to ca. 9000–8800 cal BP (Borić et al. 2014b). This may be a direct reflection of the rise in popularity of *C. rustica* beads in coastal regions of the Adriatic Sea and a wider Circum-Adriatic region (e.g., Cristiani 2012; Cristiani et al. 2014a) (*figs. 10–11*). Around the same time, or somewhat later, towards the mid-9th mill. BP, several burials at the site of Vlasac yielded evidence of *C. neritea* beads that were attached to the clothing of the deceased (Cristiani/Borić 2012). In another, currently undated but possibly Late Mesolithic, context at the site of Ostrovul Banului a number of such beads were also found together as a set (Mărgărit 2008, fig. 104). Both at Vlasac and Ostovul Banului, *C. neritea* specimens indicate a Late Mesolithic technological tradition

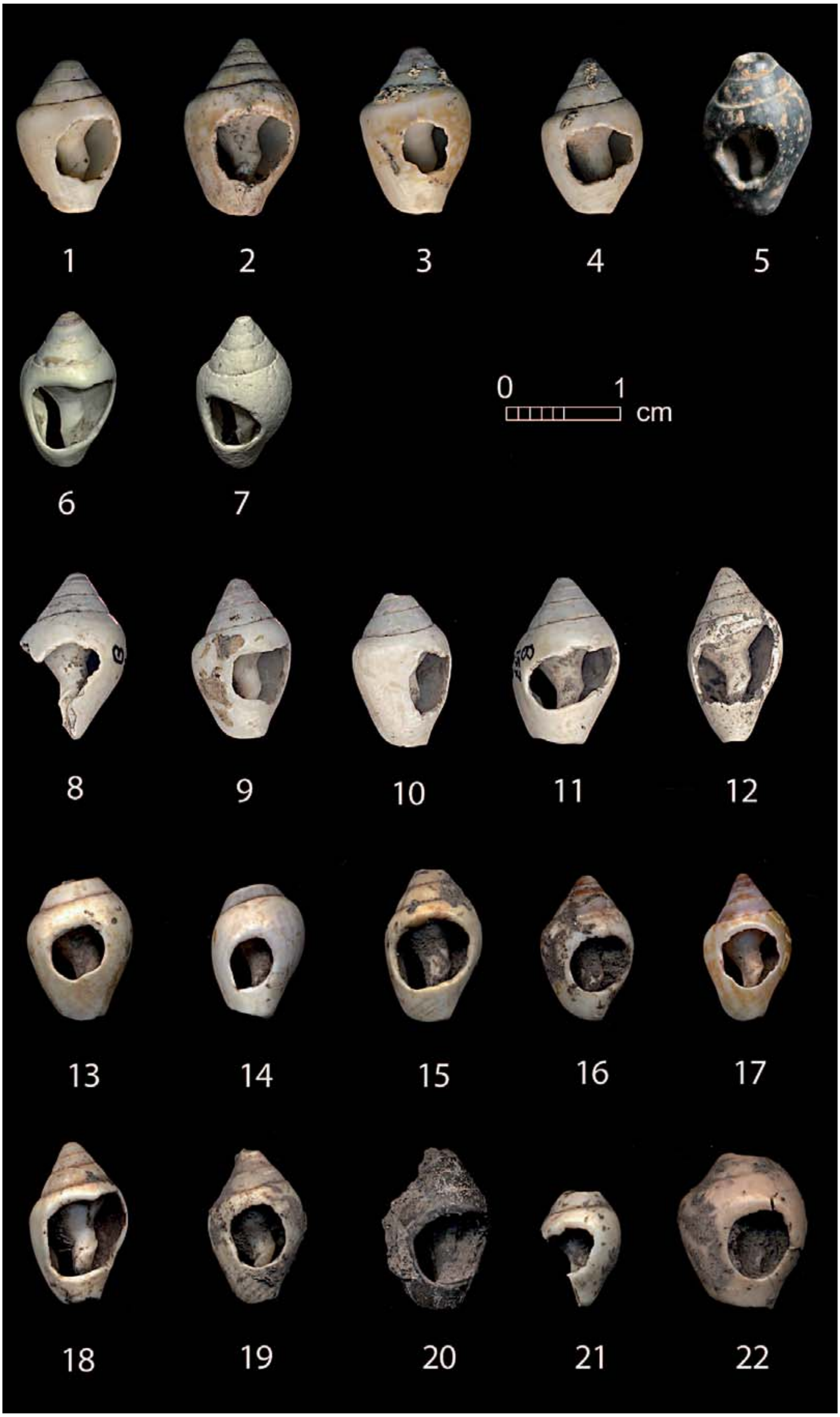

Fig. 11. A selection of *Columbella rustica* ornamental beads found in Italy and the Balkans.
1 – 4. Vela Spila; 5. Vrućа; 6 – 7. Vlasac; 8 – 12. Biarzo; 13 – 22. Pradestel.

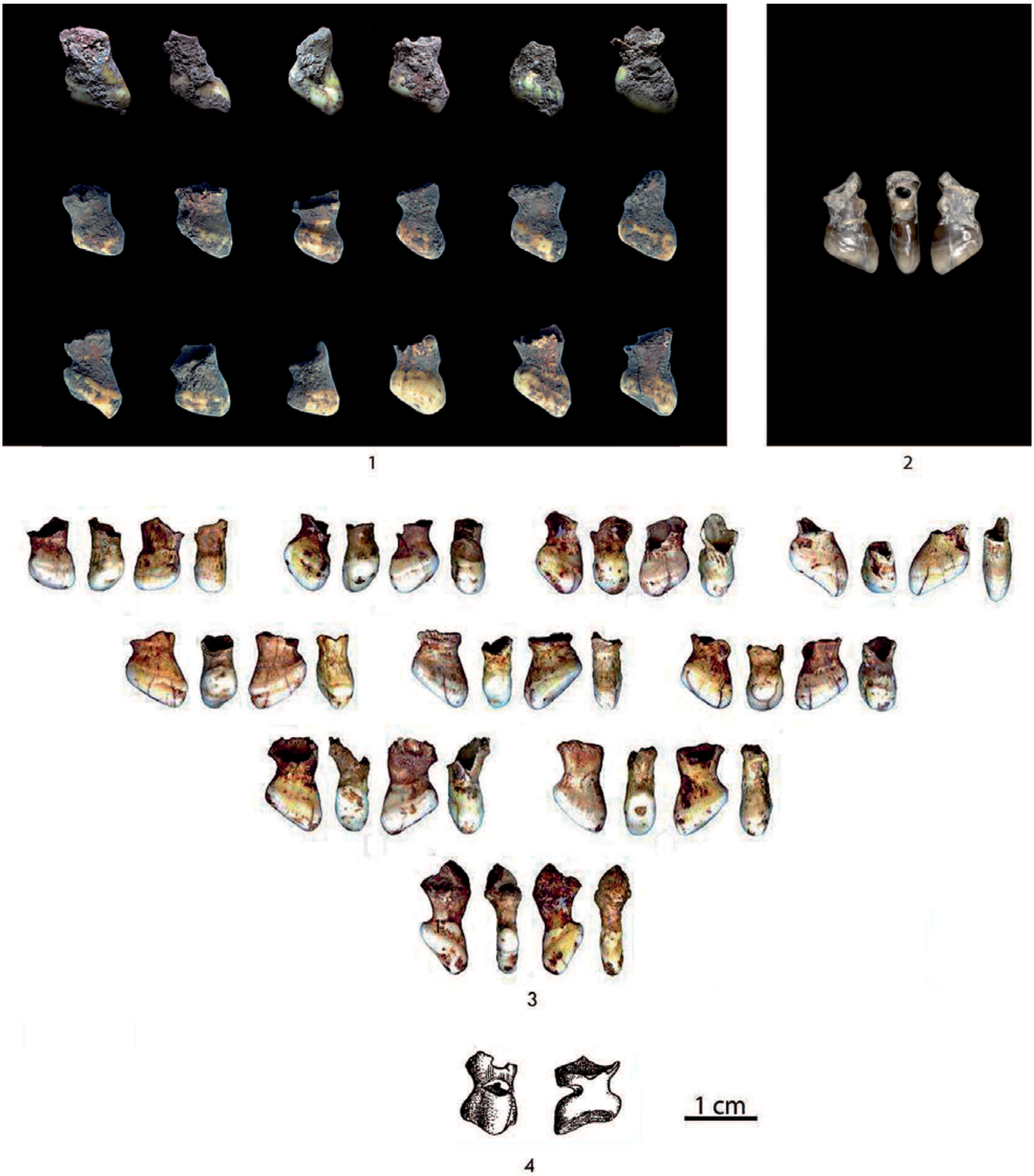

Fig. 12. Types of cyprinid teeth ornamental beads found in the Danube Gorges region, Montenegro, Crimea and the Upper Danube region.
1. Vlasac; 2. Vrbička; 3. Hohlenstein-Stadel (after Rigaud 2013); 4. Zamil-Koba I (after Kraynov 1940).

Fig. 13. A reconstruction of cloak-type embroidered garment worn by adult females and children at Late Mesolithic Vlasac on the basis of ornaments' distributions in Burials H2 and H297 (drawing: Mauro Cutrona).

of shell modifications specific to the Danube Gorges area that removed the body whorls of the shell in order to facilitate their fastening to garments (*fig. 9*), which is different from the pattern of perforation seen on Epipalaeolithic Cuina Turcului specimens (Cristiani/Borić 2012).

It seems that *C. neritea* remained popular in both Franchthi (Perlès/Vanhaeren 2010) and Klissoura 1 (Stiner 2010) caves throughout the Mesolithic. However, no primary burials from Franchthi are associated with ornaments, and possible association of *C. neritea* and Dentalium beads is only assumed for disarticulated remains of an infant (Fr 401) and a three-to-six-year-old child (Fr 414) (Cullen 1995, 277). On the other hand, no *C. neritea* beads have been found in the Mesolithic levels of Vela Spila in Croatia where *C. rustica* are the absolutely dominant gastropod species used for ornamental beads in the Mesolithic (Cristiani et al. 2014a) while there is only one *C. neritea* bead found in an assemblage again dominated by *C. rustica* beads in the Mesolithic levels of Pupićina Cave in Croatia (Komšo 2006; Komšo/Vukosavljević 2011, tab. 1).

But it was not only 'exotic' marine bead ornaments that travelled over long distances. There is documented evidence of exchanges in ornaments at the distance of over 100 km between the coastal site of Pupićina Cave in Istria and the hinterland site of Zala Cave in Croatia. While *C. rustica* beads, abundant in the Mesolithic levels of Pupićina Cave (n=90), were found in the Mesolithic levels of Zala Cave (n=nine), freshwater *Lithoglyphus naticoides* gastropods found in larger numbers at Zala Cave (n=35) were also reported at Pupićina Cave (n=six), possibly suggesting exchanges of ornaments and regular communication between coastal and inland foragers (Komšo/Vukosavljević 2011). In this particular case, it is likely that such exchanges and communication were taking place within the regional ('tribal') territories that might have corresponded to the territories of ethnographic cultures (see below).

Another example on non-marine ornamental beads that also seems to have traversed long distances relates to one particular type of ornament found in large quantities in the Danube Gorges region, where it appears with the start of the Late Mesolithic period. Cyprinid (carp species) pharyngeal teeth turned into ornamental beads either by cuts/perforations made on the neck of the tooth or by unmodified suspension using red ochre stained treads (*fig. 12*) and resin are found sometimes in hundreds in association with Late Mesolithic burials of both adults and children at the sites of Vlasac (Borić et al. 2014b; Cristiani/Borić 2012; Cristiani et al. 2014b) and Schela Cladovei (Bonsall 2008; Boroneanţ 1990). At Vlasac, these ornaments were found either on their own or in combination with *C. neritea* and in one case with *C. rustica* ornamental beads. These beads were sewn onto attires that covered the deceased and based on their distribution in burials such embroidery was in particular attached to the piece of clothing (a cloak?) that was lying beneath the deceased, i.e. the one that covered the back of the deceased or that served to wrap the body of the deceased (*fig. 13*).

We have previously noted the curious absence of red deer vestigial canine ornaments in the Danube Gorges and the fact that this is perhaps related to the rise in popularity of carp teeth beads (Cristiani/Borić 2012, 3463). Red deer canine beads were widespread among Upper Palaeolithic and Mesolithic foragers of Eurasia and beyond and were also found in the Late Epipalaeolithic levels at Cuina Turcului and Climente II in the Danube Gorges but are completely absent for the duration of the Mesolithic in this region. There is a possibility that the same range of meanings held in relation to red deer teeth ornaments by various Mesolithic communities became 'delegated' to cyprinid teeth in this regional context. That a river animal's body element was chosen as a source of material for ornaments for communities living along the big river should not be surprising. But it is also that to some extent cyprinid teeth can be seen to resemble red deer canines in shape regarding their appearance when sewed onto items of clothing. In addition, their anatomical position in the animal's body, being 'hidden' within the body, i.e. invisible before opening the body of each respective animal might have been imbued with particular significance.

An enigma regarding the distribution of this type of ornaments becomes apparent by the existence of a suite of sites in southern Germany, found in the Upper Danube region, where cyprinid teeth were also found used as ornaments, albeit

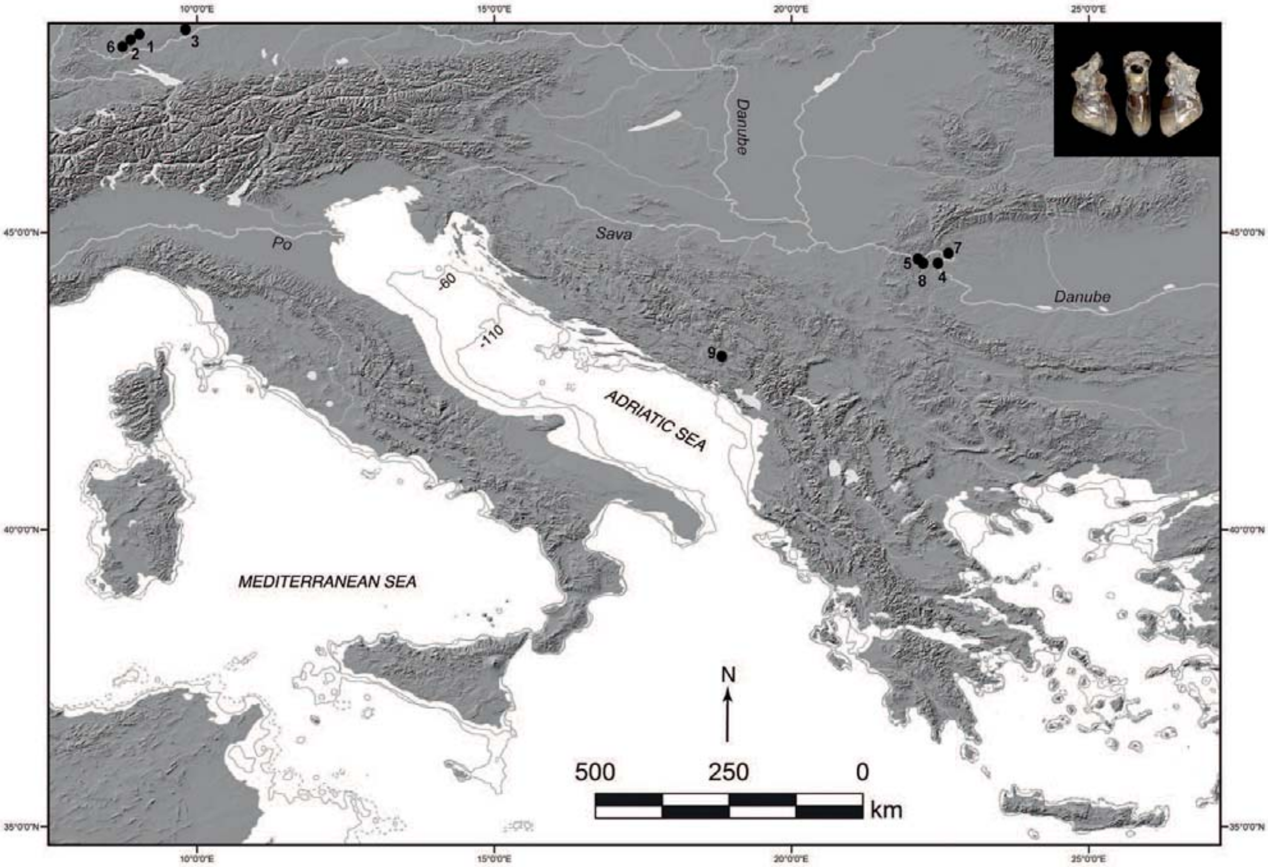

Fig. 14. Map showing the distribution of Late Mesolithic sites with cyprinid pharyngeal ornamental beads in the Balkans and the Upper Danube region. Bathymetric contours show the drop of sea levels –110m during the LGM climax and –60m by the end of the Pleistocene.
1. Burghöhle von Dietfurt; 2. Falkenstein Höhle; 3. Hohlenstein-Stadel; 4. Kula; 5. Lepenski Vir; 6. Probstfeld; 7. Schela Cladovei; 8. Vlasac; 9. Vrbička.

in smaller quantities than in the Danube Gorges area. Such ornaments were reported at the sites of Burghöhle von Dietfurt (Baden-Württemberg, Germany), Falkenstein Höhle (Bavaria, Germany), Probstfels (Baden-Württemberg, Germany), and Hohlenstein-Stadel (Baden-Württemberg, Germany) (Rigaud, 2011; Rigaud et al. 2014; see also Rähle 1978; Völzing 1938; Wetzel 1938) (*fig. 14*). At the site of Hohlenstein-Stadel these ornaments were associated with a secondary burial containing several disarticulated skulls, and might have been attached to some sort of headdress worn by the deceased who possibly suffered violent deaths. It is worth mentioning that use-wear and residue traces from both regions suggest that suspension techniques might have been similar despite different technological choices/know-hows in creating perforations (Cristiani et al. 2014b). These two regions are some 1000 km apart as the crow flies and even more distant if one is to travel along the Danube course. Moreover, there are no other known Mesolithic sites between these two regions with cyprinid teeth ornaments. Finally, existing dates suggest that the use of these ornaments in the two regions was broadly contemporaneous.

The picture about the distribution of cyprinid teeth ornaments is further complicated by the existence of two other distant regions where cyprinid teeth ornaments have also been found. First, at the cave site of Zamil-Koba I in the Crimean Peninsula, two modified cyprinid teeth ornaments were associated with a skull burial found in a pit (62cm in diameter and 30cm deep) together with other human or animal postcranial bones, charcoal and flint artefacts, indicating a Mesolithic context (Kraynov 1940, 14) (*figs. 12, 14*). Unfortunately, this context has not been dated directly so we could not be certain about the contemporaneity of this and other Mesolithic contexts where such ornaments appear (cf. Biagi/Kiosk 2010). The published drawing of one of the ornamental cyprinid teeth shows the shape of a cyprinid pharyngeal tooth and a clearly visible cut on the root of the tooth (Kraynov 1940, 23, T. V, 4 – 5), with the modification made in the same way as on the modified specimens found in the Danube Gorges, suggesting a shared technological gesture if not direct contact between the two regions. This site is more than 900 km away from the Danube Gorges region as the crow flies and still farther away from the Upper Danube region. One could possibly envisage contacts along the Lower Danube and farther along the north-eastern coast of the Black Sea. Possible links between Early Holocene flint-stone industries and the Black Sea coastal sites within the Cuina Turcului-Belolesye-Shan Koba complex have previously been suggested (Radovanović 1981; Kozłowski 1989).

The second example comes from the Mesolithic levels of the site of Vrbička Cave in western Montenegro (*figs. 12, 14*). Here, only one modified carp tooth ornamental bead was found. The modification made on the root of the tooth is identical to the ones made in the Danube Gorges area and may again hint at direct contacts between the two regions, which are some 400 km apart. The bead is found in the Late Mesolithic layer of the cave, currently AMS-dated to the beginning of the 9th mill. BP (Cristiani 2014), thus being broadly contemporaneous to the contexts in which ornamental cyprinid teeth beads appear in the Danube Gorges.

The last two examples suggest that in the Mesolithic of the Balkans even 'non-exotic' beads seem to have been transferred at very long distances that certainly went beyond the maximal territories of adjacent regional bands. In this context, ornamental beads' double character as highly charged symbolic tokens and transferable material items with relational properties becomes fully apparent. Ornamental beads enchained relationships at both individual and group levels, helping to maintain social networks and to keep distant communities abreast of the existence of others (cf. Gamble 2007; 2013). Narratives that travelled along with material objects must have also enchained mythical realities in a complex web of transformational logics, which might have been similar to those described by structural analyses of mythical motives among neighbouring groups, often subject to the rules of inversion and symmetry (cf. Lévi-Strauss 1987; 1995).

Discussion and conclusions

'Regionality is not inscribed in any straightforward way into archaeological data. It needs to be imagined before it can be perceived or measured.' (Wobst 2000, 221)

Whallon (2006) suggested a heuristic model of hunter-gatherer spatial organization in relation to the assumed hexagonal packing of spatial units (ideal model over a perfect uniform plane, cf. Haggett 1965). As he observes, one should expect 'distortions of the ideal, hexagonal territories [to] occur as they are "fitted" over specific geographical features or topography' (Whallon 2006, 266). Based on the survey of ethnographic evidence and archaeological case studies for Late Pleistocene and Early Holocene foragers in central and western Europe (e.g., Eriksen 2002; Floss 1994; 2014), this model suggests three main ranges of human mobility:

– Ranges < 200 km: movements of lithic raw materials (mostly up to 130 km).
– Ranges between 200 and 300 km range that are primarily related to social and gift-giving exchanges.
– Ranges beyond 300 km are seen as involving ceremonial and ritual exchanges (e.g., circulation of shells as personal adornment and other 'exotica').

These types of human mobility further correspond to three spatial organizational units among forager groups with corresponding estimates of territory size (*fig. 15*):

– Minimal band (25 – 30 people, 28 km radius, 2500 km²).
– Maximal regional band territory consisting of seven (175 – 210) or 19 minimal bands (475 – 570 people, 123 km radius, 47.500 km²).
– Adjacent maximal or regional bands (325 km radius, 332.500 km²).

Based on this general model of the spatial organization of forager groups, fig. 16 proposes a model

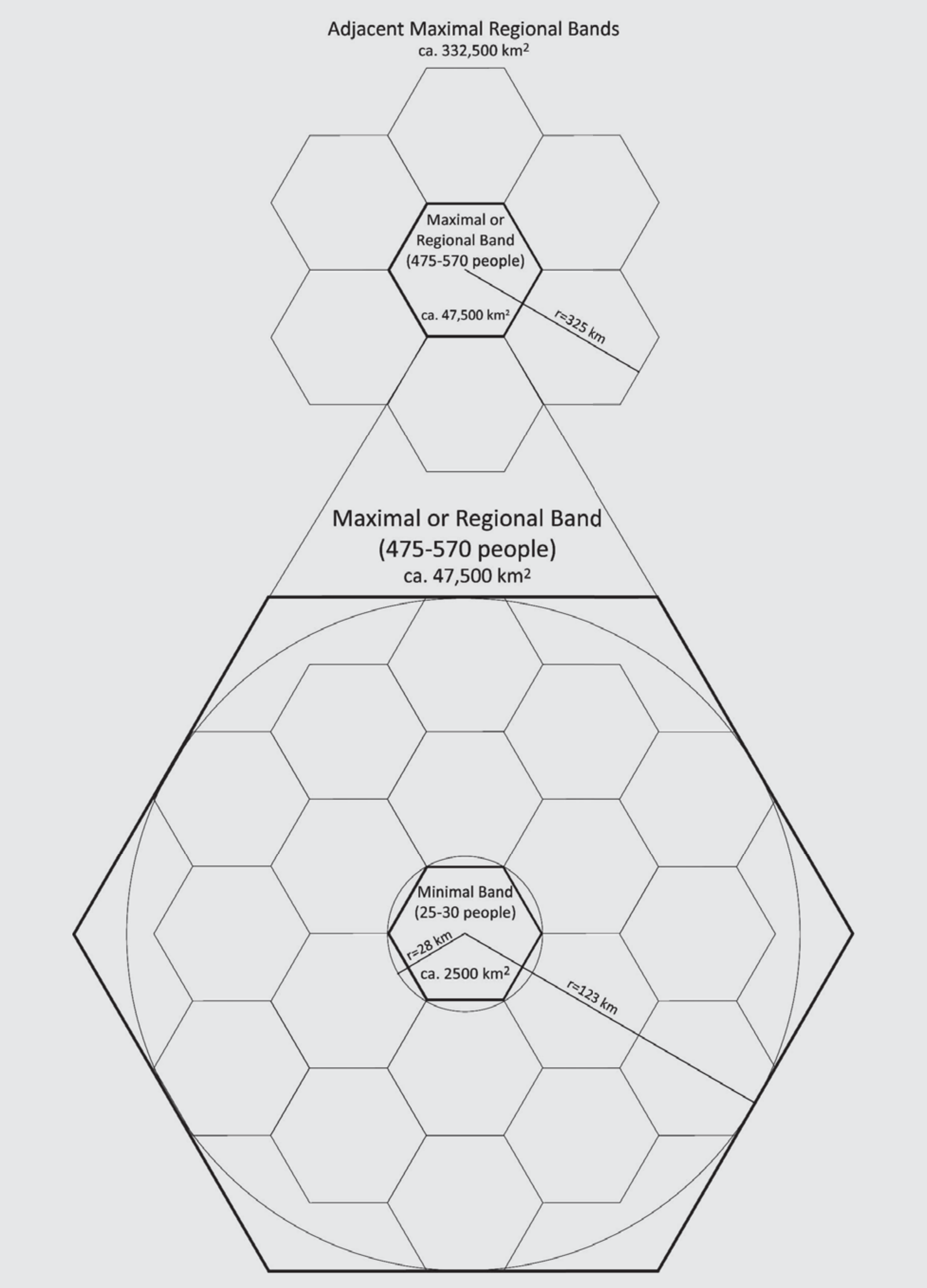

Fig. 15. Heuristic model of spatial organization of hunter-gatherer bands and their territories: hexagonal packing of spatial units over a perfect uniform plane (after Whallon 2006, fig. 4).

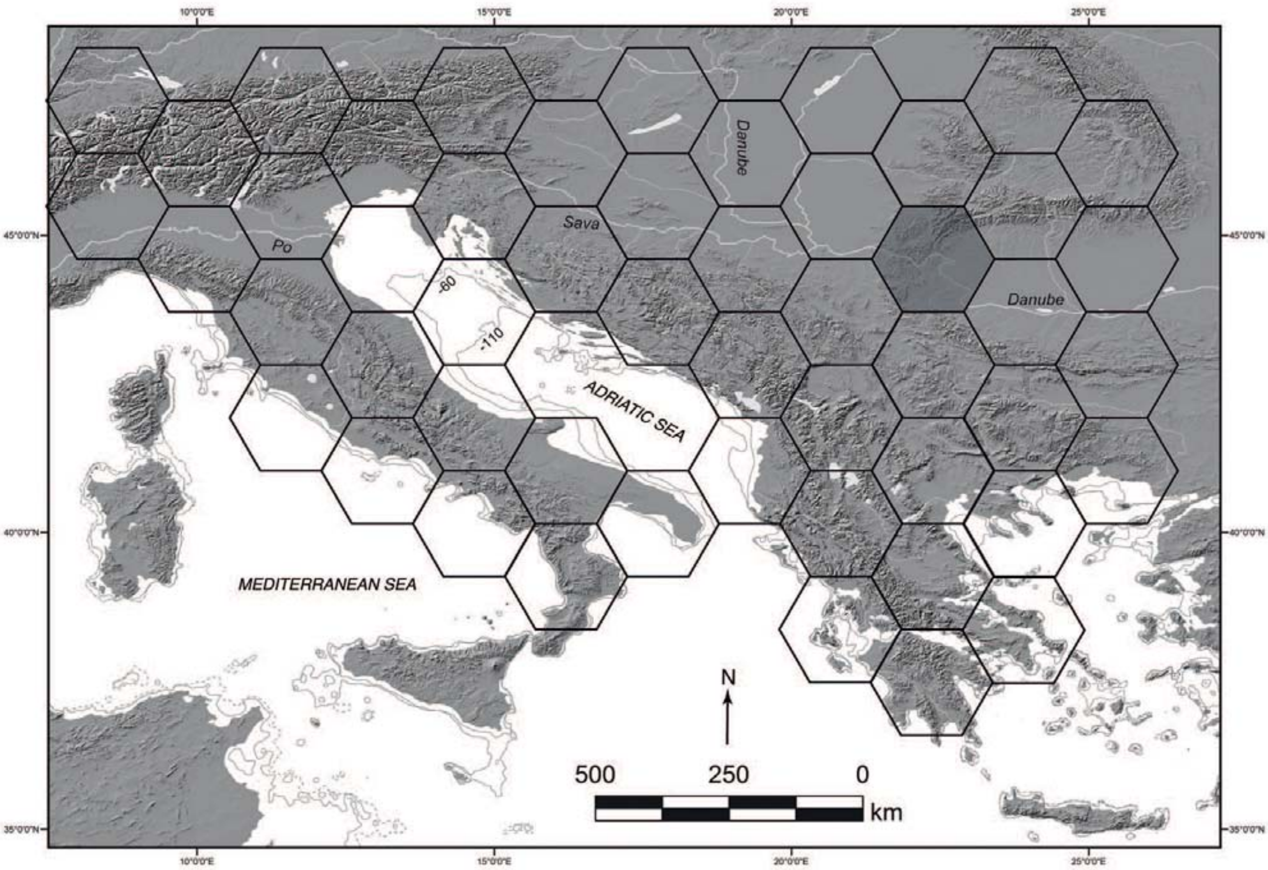

Fig. 16. An ideal heuristic model of the spatial organization of hunter-gatherers during the early prehistory of the Balkans and Italy with hexagonal packing of maximal or regional band territories with the radius of ~125 km. The starting point for the distribution of spatial packing units in real-space is the documented regional case of the long-lasting concentration of forager sites in the Danube Gorges region (darker shaded). Bathymetric contours show the drop of sea levels –110m during the LGM climax and –60m by the end of the Pleistocene.

of spatial organization of Upper Palaeolithic and Mesolithic hunter-gatherers in the Balkans and Italy with hexagonal packing of maximal or regional band territories, each with the assumed radius of ~125 km. The starting point for the given distribution of forager spatial packing units across real geographic space is the documented regional case of the long-lasting concentration of forager sites in the Danube Gorges region. In the Balkans, this is the best regional example that documents the extent of an assumed 'tribal' or maximal regional band territory. While this kind of exercise must remain highly provisional and should allow for variations in the arrangement of spatial units that must have been affected by geographical constraints to the distribution of both human groups and resources, it is here used as a heuristic model that may help us to

1) better envisage the structure of and relationships among different spatial units that structured forager social networks in these regions, and
2) focus our empirical research efforts in testing the theoretical proposal about forager spatial packing arrangements.

Yet, that tribal territories would not have been affected by either the efficiency of technology or population density is suggested by Birdsell (1968, 232) who claims that 'the size of dialectical tribal unit is insensitive to regional variations in both climate and biotic factors. Its primary determinants are competence in speech, and mobility on foot.'

There is an expectation that hunter-gatherer exchange networks for non-local raw material transfers were largely confined to distances of up to ca. 125–130 km, i.e. staying within the assumed hexagonal territories of maximal bands ('tribal' territories), whereas the distances for the distribution of decorative shells and other symbolically meaningful items often travelled across the territories of adjacent maximal bands, from ca. 200 km up to 800 km, serving to maintain long distance connections (Whallon 2006).

Evidence of long distance connections at distances beyond 1000 km throughout late Upper Palaeolithic and Mesolithic south-eastern Europe beyond adjacent maximal band territories might have been part of movements that enabled the spread of particular technological innovations related to curated weaponry, such as shouldered points and other tool types. At the same time, the spread of non-'utilitarian', symbolically-charged items or ideas, such as geometric motifs and ornaments, possibly along with mythical narratives, is also evident on the basis of the presented data. Elements of symbolic repertoires and axes of connectivity might have been established in the course of the late Upper Palaeolithic if not earlier and might have remained in place throughout the Early Holocene. Mesolithic flint raw material transfers were likely confined to the limits of maximal band territories. There are only rare examples of obsidian transfers from the Carpathian Mountains found in the Danube Gorges area in the course of the Epigravettian (Băile Herculane, Cuina Turcului: Dinan 1996a; 1996b) and Early/Middle Mesolithic (Padina: Radovanović 1981). But more work is needed in the future in order to understand knapped stone raw material transfers better.

The current data may suggest that there were some disruptions to long-distance connectivity across the Balkans and Italy at the start of the Holocene when major environmental changes ensued with the inundation of the Great Adriatic Plain and the growth of dense forests that might have obliterated partly certain communication corridors, making forager communities relatively isolated within their regional or maximal band territories. This could be reflected both in the absence of 'exotic' ornaments in the course of the Early/Middle Mesolithic at inland forager sites, as well as the primary reliance on locally available flint raw materials. However, at present, this must remain a conjecture that is based on relatively limited datasets. Interestingly, an opposite trend in the circulation of 'exotic' shells is documented in south-western Germany, with the rise in the abundance of such items in Early Mesolithic when compared to the late Upper Palaeolithic (Eriksen 2002; Whallon 2006, 268).

In the Balkans, significant changes seem to have been in place by the start of the Late Mesolithic towards the end of the 10th mill. BP. While patterns in exploitation of primarily locally available stone raw materials did not alter from the preceding earlier Mesolithic phases, ornamental beads made of local materials at both coastal and inland forager sites became widespread over significant distances in the course of the 9th mill. BP. Some of the marine shells, such as *C. neritea*, which were favourite items of decorative consumption in the Epigravettian period, now again started traversing long distances between coastal and inland forager communities as evidenced in Late Mesolithic burials at Vlasac in the Danube Gorges region. This re-emergence of *C. neritea* beads points to the long-term continuity of ornamental traditions that might have been linked to mythical narratives, which could have enabled the reinvented potency of cultural symbols of significant antiquity. However, certain marine gastropod species that only sporadically occurred as ornamental beads in the Upper Palaeolithic now became dominant and widespread, such as *C. rustica*.

New types of ornamental beads, such as cyprinid pharyngeal teeth ornaments, were also introduced in the Late Mesolithic. While it is likely that this type of ornamental bead innovation first appeared somewhere along the Danube, it is difficult to suggest the exact area of its origin as both in the Lower and Upper Danube regions the appearance of these beads was broadly contemporaneous. However, judging by similarities of perforation modifications to teeth roots on specimens from the Danube Gorges, Montenegro and Crimea, and the abundance of these beads in the Danube Gorges area, it is very likely that the place of origin for cyprinid teeth ornaments found in Montenegro and Crimea was the Danube Gorges area.

Previous examples aimed to show the potential of social network thinking for the study of Upper Palaeolithic and Mesolithic forager collectives of the Balkans and Italy. It is argued that we should expect significant long-distance mobility throughout these periods, despite possible diachronic oscillations and disruptions brought about by climatic and environmental changes. It seems that communication axis beyond maximal band territories were maintained for considerable periods of time, with the reinvention as well as remodeling of supra-regional contacts between forager groups. The evidence of these contacts attests to the importance of 'weak links' in small-world like societies.

In the course of the 9th mill. BP, if not earlier, such a vibrant world of forager contacts over considerable distances across southeastern Europe, Italy, and beyond might have also included those territories of Anatolia with already established first Neolithic, farming communities. In the second half of the mill., certain aspects of these Neolithic milieus might have influenced social and cultural practices of southeastern European foragers as previously argued for the case of the Danube Gorges foragers (Borić 2007; Borić/Stefanović 2004) and the Aegean (Reingruber 2011). Based on the evidence from the former region, in the last two centuries of the 9th mill. BP there was a clear-cut departure from the previous taste for certain 'exotic' ornamental choices, such as *C. neritea* and *C. rustica* beads. While cyprinid teeth beads were still used during this transitional period, Neolithic-like disc-and barrel-shaped beads made of Spondylus and limestone/stone became dominant in Lepenski Vir and Vlasac burials (Borić 2011; Borić/Price 2013; Borić et al. 2014b; cf. Rigaud et al. 2015). Such ornamental choices, among other strands of evidence, reflect a fundamental transformation of previously existent forager social networks in the wider region. Our ability to reconstruct and analyse social networks that characterised foragers as well as the first agro-pastoralist communities, drawing conclusions about the functioning of 'weak links' among these different small-world like societies, remains an exciting and potent future research venture in this and other regional contexts.

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This volume provides an insight into the current state of archaeological research in Southeast Europe and its adjacent regions, spanning chronologically from the Aurignacian to the beginning of the Neolithic period. In ten contributions by leading experts in this field, specific topics in regions ranging from the Aegean Sea, the Carpathians, and Western Anatolia to the Apennine Peninsula and Central Europe are presented. This book represents the proceedings of an international workshop, held in May 2014 in Tübingen as a part of the work of the Collaborative Research Centre 1070 ResourceCultures.

The research activities of Raiko Krauss are focused upon the timespan between the Neolithic and the Bronze Age within Central and South-East Europe. Harald Floss is a renowned expert of the Palaeolithic in Europe and a specialist in the study of the transition from the last Neanderthals to Early modern humans. Both teach at the University of Tübingen.

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