Current Approaches to Collective Burials in the Late European Prehistory

Edited by

Tiago Tomé, Marta Díaz-Zorita Bonilla, Ana Maria Silva, Claudia Cunha, Rui Boaventura

Archaeopress Archaeology

Archaeopress Publishing Ltd
Gordon House
276 Banbury Road
Oxford OX2 7ED

www.archaeopress.com

ISBN 978 1 78491 721 0
ISBN 978 1 78491 722 7 (e-Pdf)

COVER IMAGE: Structure 10.034 from PP4 Montelirio at Valencina de la Concepción. Courtesy of the Research Group ATLAS, University of Seville (Spain). Photograph: José Peinado Cucarella.

VOLUME EDITORS: Tiago Tomé, Marta Díaz-Zorita Bonilla, Ana Maria Silva, Claudia Cunha, Rui Boaventura

SERIES EDITOR: The board of UISPP

CO-EDITORS – CIAS – Research Centre for Anthropology and Health, University of Coimbra

Research Centre for Anthropology and Health

SERIES PROPERTY: UISPP – International Union of Prehistoric and Protohistoric Sciences

Proceedings of the XVII World UISPP Congress, Burgos (Spain)
September 1–7 2014

KEY-WORDS IN THIS VOLUME: collective burials, late Prehistory, western Europe, bioarchaeology, funerary patterns

UISPP PROCEEDINGS SERIES is a printed on demand and an open access publication, edited by UISPP through Archaeopress

Contents

List of Figures and Tables

M. Díaz-Zorita Bonilla et al.: **Tomb 3 at La Pijotilla (Solana de los Barros, Badajoz, Spain): A Bioarchaeological Study of a Copper Age Collective Burial**

L. Miguel Marado et al.: **On the applicability of the assessment of dental tooth wear for the study of collective prehistoric burials**

M. Edo et al.: **Cova de Can Sadurní (Begues, Barcelona). Towards the definition of a multiple funerary model inside caves during the middle Neolithic I in the northeast of the Iberian Peninsula**

M.F. Rolfo et al.: **Mora Cavorso Cave: a collective underground burial in Neolithic central Italy**

T. Fernández-Crespo: **Bioarchaeological approach to the Late Neolithic and Chalcolithic population of Cameros megalithic group (La Rioja, Spain)**

B. González Rabanal et al.: **Anthropological and taphonomical study of human remains from the burial cave of El Espinoso (Ribadedeva, Asturias, Spain)**

L. Lai et al.: **Diet and ritual in the western Mediterranean Copper Age: human and animal stable isotopes from the collective burial at S. Caterina di Pittinuri (Sardinia, Italy)**

P.M. López Aldana and A. Pajuelo Pando: **The artificial caves of Valencina de la Concepción (Seville)**

T. Pereira et al.: **Multiple burials in pit graves from Recent Prehistory at Southwest of Iberia: The cases of Monte do Vale do Ouro 2 (Ferreira do Alentejo), Ribeira de S. Domingos 1 and Alto de Brinches 3 (Serpa)**

S. Robles Carrasco et al.: **Bioarchaeological analysis at the Copper Age site of Valencina de la Concepción (Seville, Spain): The PP4-Montelirio sector**

T. Tomé et al.: **Assessing spatial dispersion of human remains in collective burials: A GIS approach to the burial-caves of the Nabão Valley (North Ribatejo, Portugal)**

Assessing spatial dispersion of human remains in collective burials: A GIS approach to the burial-caves of the Nabão Valley (North Ribatejo, Portugal)

Tiago Tomé[1,2,3], Claudia Cunha[4,2], Ana Maria Silva[2],
Luiz Oosterbeek[3] and Ana Cruz[3,4]

[1] Instituto de Filosofia e Ciências Humanas – Universidade Federal do Pará, Brasil
[2] Laboratório de Pré-História, CIAS – Departamento Ciências da Vida, Universidade de Coimbra, Portugal
[3] GQP-CG, Grupo Quaternário e Pré-História, Centro de Geociências (I&D 73 – FCT)/ Instituto Terra e Memória, Portugal
[4] Programa de Capacitação Institucional MCTI/MPEG, Coordenação de Ciências Humanas, Museu Paraense Emílio Goeldi, Belém, Pará, Brasil
[5] Centro de Pré-História/Instituto Politécnico de Tomar, Portugal
tiagotome@gmail.com

Abstract

Two burial-caves of the Nabão Valley, Gruta do Cadaval and Gruta dos Ossos, each containing the remains of circa 30 individuals, were the subject of a GIS assessment, aiming at the definition of spatial dispersion patterns for the human skeletal remains. Results indicate that, although there are some general similarities in these burials, differing spatial patterns exist among both caves, particularly regarding concentrations of adult versus non-adult remains, as well as on the spatial distribution of specific skeletal parts.

Keywords

Collective burials, Geographic Information Systems, North Ribatejo

Resumé

Deux grottes de la Vallée du Nabão, Gruta do Cadaval et Gruta dos Ossos, contenant chacune les restes osseux d'environ 30 personnes, ont été soumises à une évaluation par des SIG, visant à la définition de modèles de dispersion spatiale des restes humains. Les résultats indiquent que, qu'il y ait certaines similitudes générales entre ces sépulcres, différentes configurations spatiales sont visibles entre les deux grottes, en particulier sur les concentrations des restes squelettiques d'adultes versus les restes de non-adultes, ainsi que sur la distribution spatiale des sections spécifiques du squelette.

Mots-clés

Tombes collectives, Systèmes d'Information Géographique, Haut Ribatejo

Introduction

Geographic Information Systems (GIS) applications in Archaeology represent a dynamic field, rooted in the late 1970's (Wheatley and Gillings, 2002; Chapman, 2006). The use of GIS as a toolkit for the storage, visualization, manipulation and analysis of archaeological data became more common up until the early 1990's, especially in Anglo-Saxon countries. Nevertheless, archaeological projects in Continental Europe would also take up on the use of GIS, making it a common tool in current-days European Archaeology. Nowadays, archaeological GIS covers all sorts of sub-fields and applications, being used for such different purposes as the mapping of finds or sites in a Cultural Resource Management perspective, the reconstruction and analysis of landscapes and sites (through the use, for instance, of visibility assessments, cost-path or site catchment analysis), or the development of predictive models for site locations. (Gaffney and Stancic, 1991; Lock and Stancic, 1995; Moscati, 1998; Djindjian, 1998; Lock, 2000; Wheatley and Gillings, 2002; Katsianis and Tsipidis, 2005; García Sanjuan *et al.*, 2009). In a more theoretical point of view, GIS can also be seen as 'a place to think', virtual environments in which to test hypothesis of a spatial nature (Gillings and Goodrick, 1996, *in* Chapman, 2006).

Similarly, Anthropology has also gradually adopted GIS as part of its toolkit, applying it to such diverse fields of inquiry as Social Anthropology, Paleoanthropology, Biological Anthropology or Forensic Anthropology (Aldenderfer and Maschner, 1996; Herrmann, 2002; Field *et al.*, 2007; Agosto *et al.*, 2008; Herrmann and Devlin, 2008; Dirkmaat *et al.*, 2008; Anemone *et al.*, 2011). Diversity of possible applications led to the development of approaches using GIS such as an aid to the determination of the Minimum Number of Individuals in North American collective burials (Herrmann and Devlin, 2008); in the analysis of spatial dispersion of human remains inside Honduran burial-caves (Herrmann, 2002); for the evaluation of potential migratory routes taken by the early *Homo sapiens* in the spread across Southern Asia (Field *et al.*, 2007); in creating and managing an inventory of paleoanthropological finds in Ethiopia (Anemone *et al.*, 2011).

Late Prehistory collective burials of Europe are a type of context where we believe GIS may prove to be a very important analytical tool. Such contexts often present taphonomical challenges to interpretation, due to the disarticulation and fragmentation processes human skeletal remains usually undergo. In Portugal, many of these burials were excavated throughout the 19th and 20th centuries. Many older excavations displayed little care for a detailed recording of human remains, with many bones being discarded, their study deemed useless (Silva, 2002; 2003; Boaventura *et al.*, 2014). Indeed, for a long time, it was quite common that only some of the human skeletal remains were recovered during excavation of this type of burials, namely cranial remains and larger bones, such as the *os coxae* or long bones, if they were in a good state of preservation. Also, the fact that these deposits were usually highly fragmented and disarticulated led, in many cases, to their definition as secondary burials. Regardless of these contingencies, recent assessments of Portuguese prehistoric collective burial skeletal samples have been able to shed some light on funerary aspects of these societies; for instance, several collective burials formerly considered as secondary are currently defined as primary burial sites (Silva, 2002; 2003; Tomé, 2011; Boaventura *et al.*, 2014), due to the application of methods aimed at assessing the representativeness of skeletal elements in samples composed of commingled remains, such as skeletal weight or tooth proportion (Silva, 2002; Silva *et al.*, 2009).

Materials and Methods

Two burial-caves were considered for GIS assessment, Gruta do Cadaval (CDV) and Gruta dos Ossos (GRO), both belonging to the Canteirões Late Prehistoric burial-caves complex located in the North Ribatejo, Portugal (Figure 1). Sample choice was determined by several factors: both caves share a similar morphology; they were excavated in the 1980's, with care being taken regarding tridimensional coordination of the remains; the samples have a partially overlapping, sequential, chronology – thus allowing for a comparative approach.

CDV contained a highly disturbed collective burial deposit – no organization patterning was identifiable during excavation, suggesting either that depositions were performed quite close to the surface (facilitating the dispersion of the remains due to posterior animal activity, for instance) or the presence of a more complex funerary gestures sequence, leading to a complete disarticulation of human remains. Radiocarbon dating from this context indicates a chronology spanning from the end of the 5th millennium BC to the mid-4th millennium BC, corresponding to the Middle Neolithic (Oosterbeek, 1994; 2003; Cruz, 1997).

GRO, on the other hand, contained a less fragmented skeletal sample, also forming a collective burial deposit. Fieldwork suggested that this collective burial was more structured, in terms of the reorganization of different types of bones. Radiocarbon dating indicates that this cave was used from the mid-4th millennium BC to, at least, the early 3rd millennium BC, placing it in the Late Neolithic (Oosterbeek, 1993; Cruz 1997; Tomé, 2006).

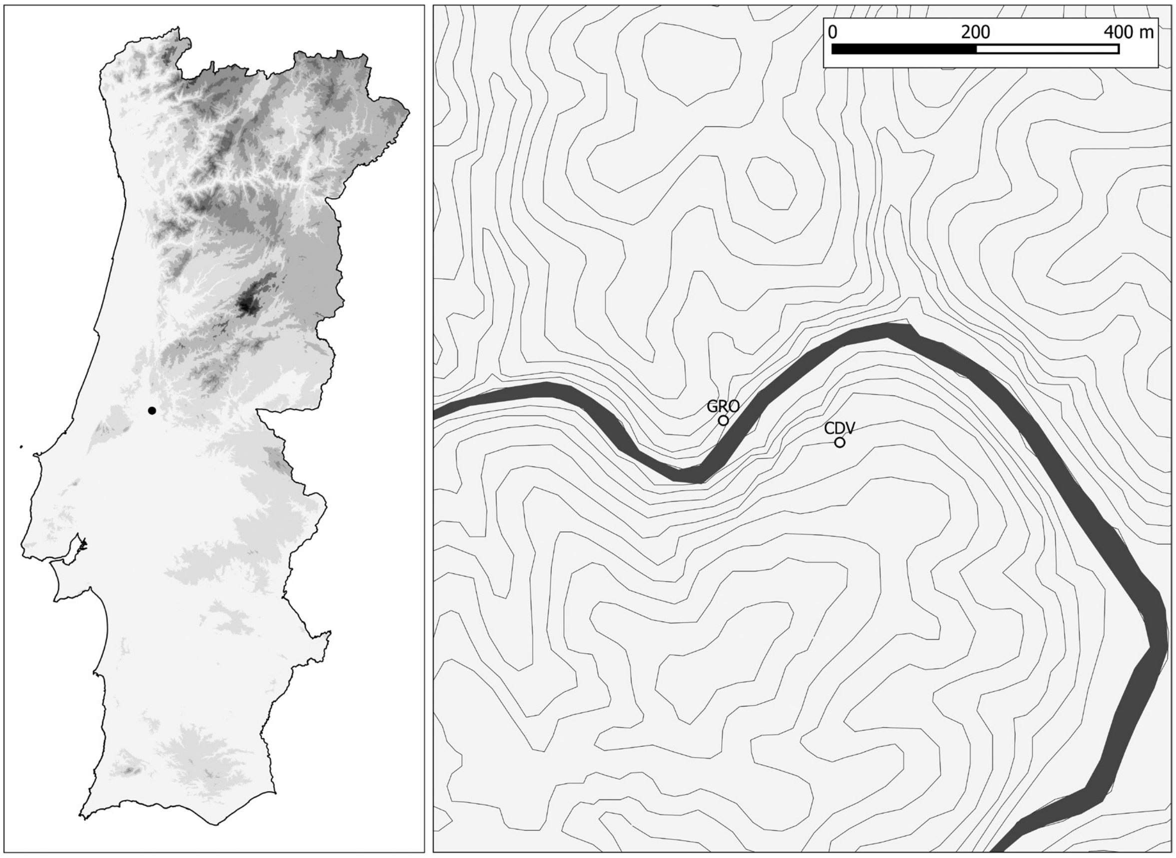

Figure 1. Location of CDV and GRO.

Both CDV and GRO held the commingled remains of circa 30 individuals, including both sexes and all age categories (Tomé, 2011; Tomé and Silva, 2013).

A database combining information resulting from the osteological assessment and the original field records was assembled. While the osteological assessment represented the majority of the information, allowing us to accurately categorize and/or filter the records according to the desired analysis, field records were fundamental in providing the spatial information needed for a GIS assessment to be performed. The vast majority of human remains exhumed from both these caves were spatially referenced, allowing for several approaches to the spatial patterns. In this study we decided to develop a strategy that focused specifically on the density of human remains inside each burial deposit.

Kernel Density Estimation, when applied to geostatistics and spatial analysis in general, is a method used to create a surface from a data plot, allowing for the representation of the density of events in a given area (Larmarange, 2013). It is an appropriate technique for point data (Silverman, 1986). Density (or intensity) analysis provides a way of estimating the change of frequency of distributions for point data over the study area (Sayer and Wienhold, 2013).

This technique is used in many different fields of spatial analysis and has, in recent years, been applied to several aspects of archaeological research (see, for instance, Baxter *et al.*, 1997; Keeler, 2007; Grove, 2011; Cascalheira and Gonçalves, 2012; Sayer and Wienhold, 2013).

The point data files created from this combined dataset were used to analyze spatial dispersion of the human remains, attempting to correlate biological parameters determined in the osteological assessment. Kernel Density Estimation was performed on the point data files, generating plots representing the spatial dispersion of human remains inside each cave. A first assessment was executed using bone count (*i.e.*, the presence of a certain number of bones in each area) as the variable for plot generation. After global kernel density maps were available, representing the areas of each cave containing human remains concentrations, separate plots were generated for adult and non-adult remains, in order to determine whether there were any discernible patterns in the deposition of different age-class individuals. Finally, anatomically filtered plots were created, defining the deposition areas of cranial remains, vertebrae, long bones, hand and foot bones.

A second analytical run was performed, using the same approach, this time using bone weight as the variable for plot generation, based upon the following reasoning: if we consider a single hand, it contains 27 bones. When creating a kernel density map using the number of bones as the variable, this will produce a strong concentration in the area where that hand is deposited. On the opposite end, we would need for all of the long bones of several individuals to be tightly packed together in order to get a similar concentration depicted in that same plot. Additionally, a small fragment of a femur would be given the same influence in the density map generation as a complete femur. Thus, bone count introduces important deviations in the representation of bone density inside the burial deposit, which must be accounted for.

Bone weight, on the other hand, takes into consideration the dimensions of different anatomical elements or bone fragments thus seeming more reliable for our assessment. In order to take into consideration the smaller, lighter elements and fragments, both bone count and bone weight density maps were averaged in a third set of plots, which were then used in the analysis.

All of the data treatment and assessment was performed with Open Source GIS software (QGIS 2.2 Valmiera).

Results

Our results suggest some general similarities among CDV and GRO regarding spatial dispersion of human remains. Both caves exhibit a main depositional cluster in the central part of the room closer to the entrance. In both cases there is also a secondary cluster, located in smaller, deeper rooms (Figure 2). Thus, easily accessible funerary deposits were formed, allowing for the post-depositional manipulation of human remains. Areas of more difficult access inside both caves were, nevertheless, used for funerary purposes, although human remains concentration on such regions was clearly less intense.

Besides the overall resemblances, our results reveal that each burial context displays its particular features regarding the spatial dispersion of human remains. When comparing adult versus non-adult

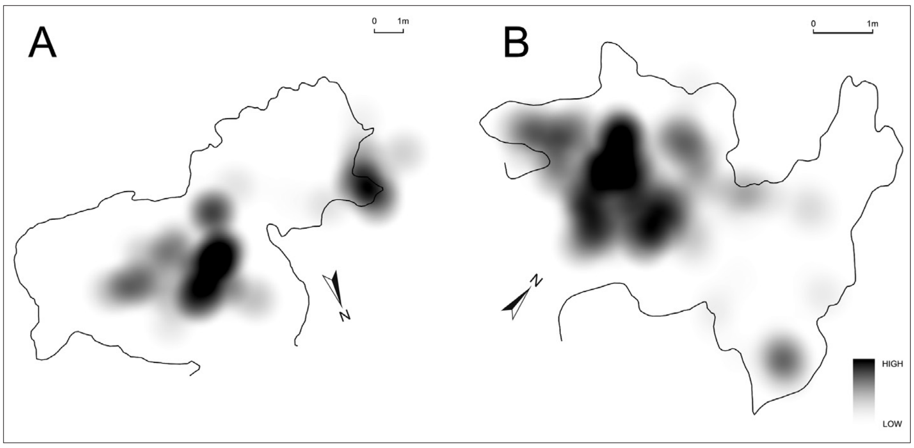

Figure 2. Global spatial dispersion of skeletal remains (A – CDV; B – GRO).

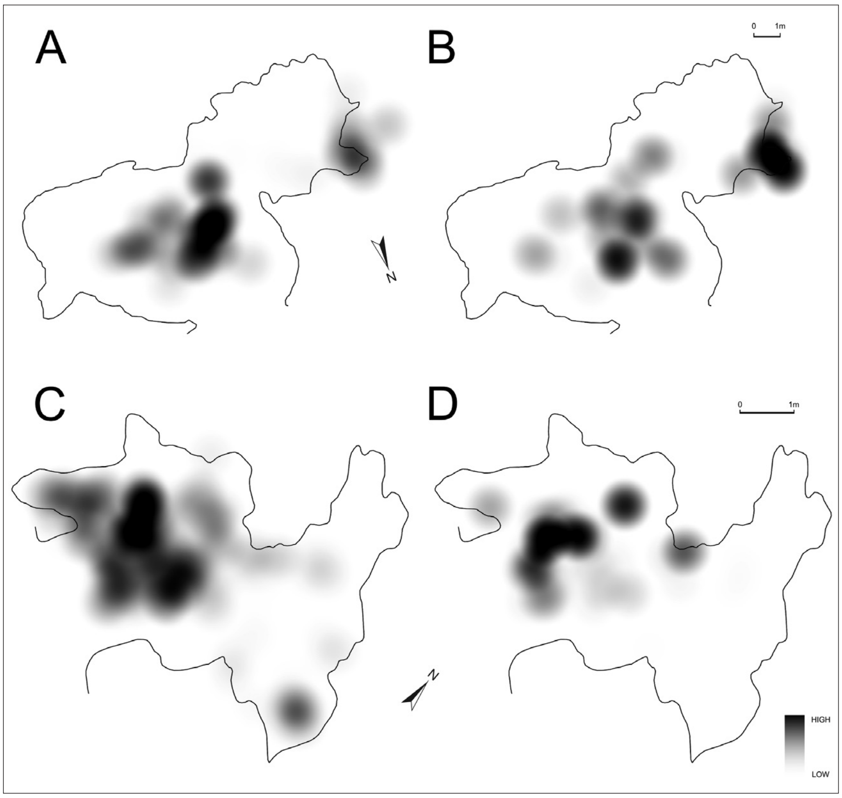

Figure 3. Adults *versus* non-adults skeletal remains distribution. Top row: CDV (A – Adults; B – Non-adults); Bottom row: GRO (C – Adults; D – Non-adults).

remains distribution (Figure 3), density maps for CDV indicate that, although both clusters contained elements from both age-groups, adult remains were concentrated mostly in the main cluster, closer to the cave entrance, whilst the majority of non-adult skeletal remains were located in the secondary cluster. It would seem, then, that non-adult remains were mostly being deposited on a different area inside the cave than adult remains. The same comparison applied to GRO does not yield the same results, since both adult and non-adult skeletal remains cluster strongly close to the cave entrance; additionally, non-adult remains appear to be absent in the secondary accumulation at the deeper area of the cave.

Regarding specific skeletal regions, particular spatial patterns also arise. CDV shows a concentration of cranial and axial remains in the main cluster. Although we can attest their presence also in the secondary cluster, this smaller concentration of human remains is mostly composed of appendicular bones from both upper and lower limbs (Figure 4).

As for GRO, kernel density maps indicate that the secondary cluster is composed mostly of hand and foot bones (it is worth noting that cranial remains appear to be completely absent from this cluster). The remaining skeletal categories are much more clearly concentrated in the main cluster but, still, differential distributions of bone categories seem visible within it. First, cranial remains appear tightly packed in the central area of the cluster. Second, long bones also seem to have a particular distribution inside this cluster, with upper limb bones displaying a stronger concentration at its core, while lower limb bones appear to be more peripheral – the matrix corresponding to the latter shows them closer to the cave walls, besides revealing the presence of a clear concentration of lower limb bones inside a small niche, located to the left of the main entrance (Figures 5 and 6).

Final Remarks

Our results indicate that, although both of these burial-caves of the Nabão valley share some traits in terms of the distribution of human remains, they also exhibit several differences among them.

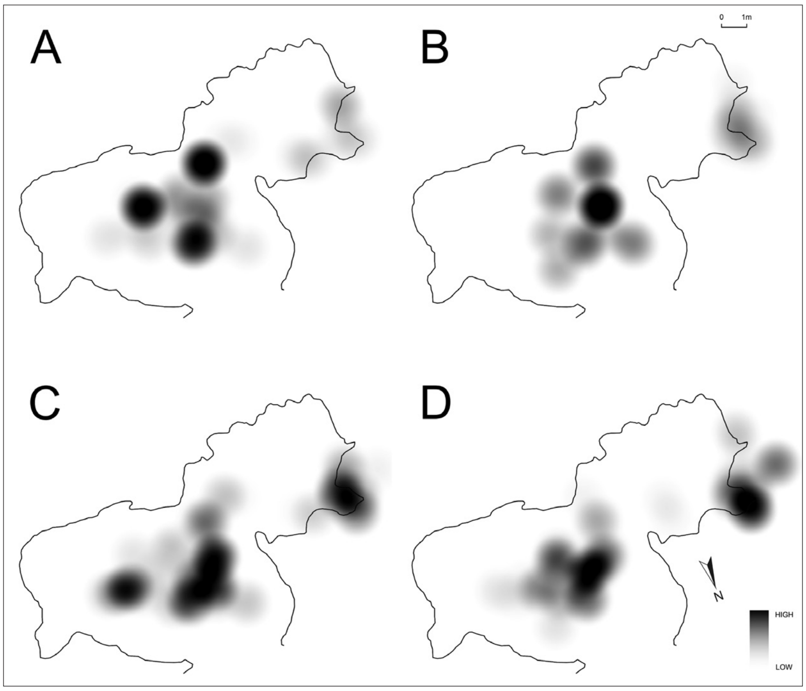

Figure 4. Spatial dispersion by skeletal region at CDV (A – Cranial remains; B – Vertebrae; C – Long bones; D – Hand and foot bones).

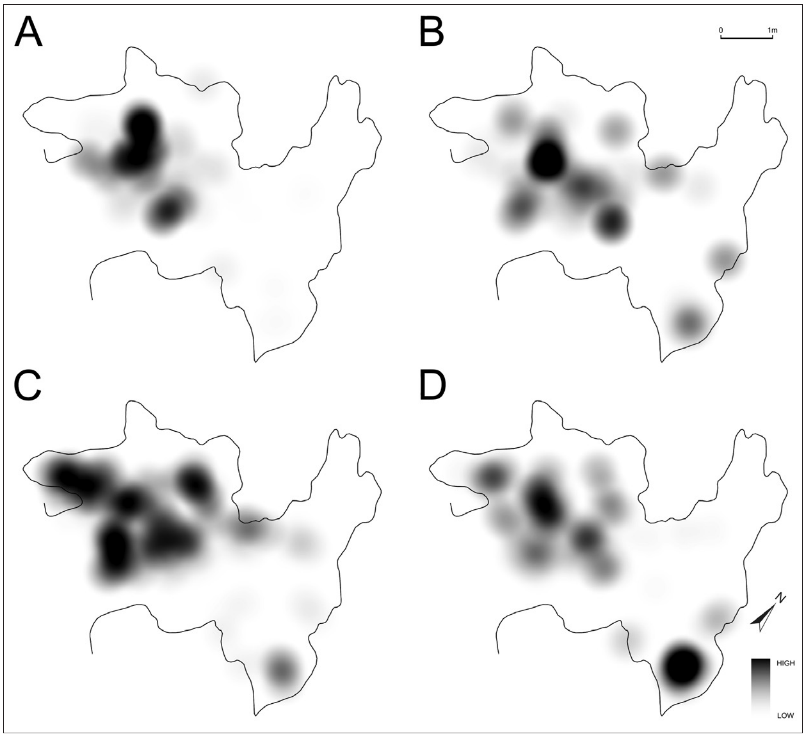

Figure 5. Spatial dispersion by skeletal region at GRO (A – Cranial remains; B – Vertebrae; C – Long bones; D – Hand and foot bones).

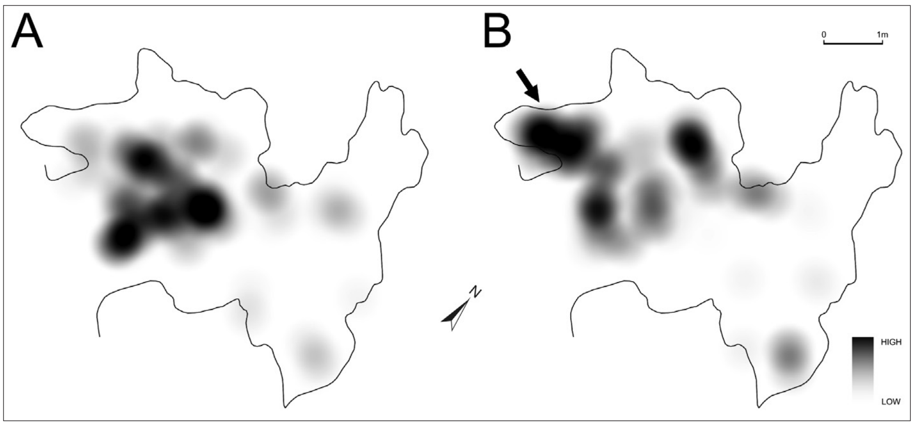

Figure 6. Differential dispersion patterns for upper and lower limb bones at GRO (A – Upper limb; B – Lower limb; Arrow indicates cluster of lower limb bones on lateral niche close to the cave entrance).

It is not clear how different depositional areas correlate on each cave – did the smaller, secondary clusters correspond to areas where some bones were discarded during the manipulation processes occurring on the larger clusters? The fact that during osteological assessment very few secondary anatomical connections were identified further hinders the clarification of this issue.

Differences among both caves dispersion patterns may be revealing of discrete shifts in the funerary practices – and social/ideological rules governing them – performed by Late Prehistoric communities of the North Ribatejo. Two aspects could relate to this idea: (I) the apparent segregation of non-adults in CDV at the secondary cluster, seemingly non-existent at a later stage in GRO, which may indicate a change in the way younger individuals were regarded inside the community, as far as funerary treatment goes. Could it be that non-adults were being given a funerary treatment more similar to the one being performed for adult individuals in the late 4th millennium BC, when compared to its late 5th-early 4th millennia counterparts?; (II) the differing pattern of upper versus lower limb bones spatial dispersion in GRO, possibly reflecting specific post-depositional manipulation sequences which do not seem to be at play in CDV. A very clear case of this is the small niche, to the left of the cave entrance, almost exclusively dedicated to the deposition of lower limb bones.

This interpretation would converge with the hypothesis of a long lasting cultural tradition in the Nabão valley bearing a relation to the coastal Neolithic spread, which would be gradually impacted by the contacts with another tradition, further inland, related to the megaliths complex (Cruz 1997; Oosterbeek 1994, 2003; Tomé and Oosterbeek 2011). The slightly younger chronology of GRO, placing it closer to such proposed impact, suggests that the differential consideration of non-adults could correspond to times of intercultural relations, either as a consequence of new cultural approaches intake (in case the other tradition had no such segregation) or as a social adaptation mechanism (symbolic enlargement of the group through the 'emancipation' of non-adults, in order to resist to the outer influence that, as we know, ultimately would prevail).

The results presented here are, nevertheless, quite partial and further analytical developments should be considered. Statistical analysis may provide a deeper insight into the spatial dispersion patterns that became apparent from the present assessment.

GIS are certainly an important tool for the study of collective burials. Furthermore, the use of Open Source software allows for an inexpensive approach. This study demonstrates that, in the vast realm of analytical techniques allowed by GIS, the use of kernel density estimates may be a viable path in the study of prehistoric collective burials.

Acknowledgments

The authors wish to thank CIAS – Research Center in Anthropology and Health (Universidade de Coimbra) and CGEO – Geosciences Research Centre (UC/IPT), for the support given to the participation of several of us at the UISPP XVII Congress. The second author (CC) was supported by a grant from FCT – Fundação para a Ciência e a Tecnologia (Ministério da Educação e Ciência, Governo de Portugal) with the reference SFRH/BD/70183/2010.

References

Agosto, E.; Ajmar, A.; Boccardo, P.; Tonolo, F.; Lingua, A. (2008) – Crime scene reconstruction using a fully geomatic approach. Sensors. 8, p. 6280-6302.

Aldenderfer, M.; Maschner, H. (1996) – Anthropology, space and Geographic Information Systems. Oxford University Press.

Anemone, R.; Conroy, G.; Emerson, C. (2011) – GIS and Paleoanthropology: Incorporating new approaches from the Geospatial Sciences in the analysis of primate and human evolution. Yearbook of Physical Anthropology. 54, p. 19-46.

Baxter, M.J.; Beardah, C.C.; Wright, R.V.S. (1997) – Some archaeological applications of kernel density estimates. Journal of Archaeological Science. 24:4, p. 347-354.

Boaventura, R.; Ferreira, M.T.; Neves, M.J.; Silva, A.M. (2014) – Funerary practices and anthropology during Middle-Late Neolithic (4th and 3rd Millennia BCE) in Portugal: Old bones, new insights. Anthropologie. LII/2, p. 183-205.

Cascalheira, J.; Gonçalves, C. (2012) – Spatial analysis and site formation processes of the Mesolithic shellmiddens of Cabeço da Amoreira (Muge, Portugal). In Cascalheira, J.; Gonçalves, C. (eds.) – Promontoria 16 (Actas das IV Jornadas de Jovens em Investigação Arqueológica) Faro: Universidade do Algarve, p. 75-82.

Chapman, H. (2006) – Landscape Archaeology and GIS. The History Press Ltd.

Cruz, A.R. (1997) – Vale do Nabão: do Neolítico à Idade do Bronze. Arkeos 3. Tomar: CEIPHAR.

Dirkmaat, D.; Cabo, L.; Ousley, S.; Symes, S. (2008) – New perspectives in Forensic Anthropology. Yearbook of Physical Anthropology. 51, p. 33-52.

Djindjian, F. (1998) – GIS usage in worldwide Archaeology. Archeologia e Calcolatori. IX, p. 19-29.

Gaffney, V.; Stancic, Z. (1991) – GIS approaches to regional analysis: a case study of the island of Hvar. Ljubljana: Znanstveni Institut Filozofske Fakultete.

Field, J.; Petraglia, M.; Lahr, M. (2007) – The southern dispersal hypothesis and the South Asian archaeological record: Examination of dispersal routes through GIS analysis. Journal of Anthropological Archaeology. 26, p. 88-108.

García Sanjuan, L.; Wheatley, D.; Murrieta Flores, P.; Márquez Perez, J. (2009) – Los SIG y el análisis espacial en Arqueología. Aplicaciones en la Prehistoria Reciente del Sur de España. In Nieto, X.; Ángel Cau, M., eds. – Arqueología Nàutica Mediterrània. Monografies del CASC 8, p. 163-180.

Grove, M. (2011) – A spatio-temporal kernel method for mapping changes in prehistoric land-use patterns. Archaeometry. 53:5, p. 1012-1030.

Herrmann, N. (2002) – GIS applied to Bioarchaeology: An example from the Río Talgua caves in Northeast Honduras. Journal of Cave and Karst Studies. 64:1, p. 17-22.

Herrmann, N.; Devlin, J. (2008) – Assessment of commingled human remains using a GIS-based approach. In Adams, B.; Byrd, J., eds. – Recovery, Analysis, and Identification of Commingled Human Remains. Humana Press, p. 257-269.

Katsianis, M.; Tsipidis, S. (2005) – Trends and problems in archaeological GIS applications. In Triantis, D.; Vallianatos, F., eds. – CD-Rom Proceedings of the 2005 WSEAS International Conference on Engineering Education (Conference Session: Educational & Instructional Tools in History & Archaeology), Vouliagmeni, Athens, Greece, 8-10/7/2005.

Keeler, D. (2007) – Intrasite spatial analysis of a Late Upper Paleolithic French site using Geographic Information Systems. Journal of World Anthropology. III/1, p. 1-40.

Larmarange, J. (2013) – Mapping Demographic and Health Surveys (DHS): a method to estimate regional trends of a proportion. Extended abstract presented to the XXVII International Population Conference (Busan, 26-31 August 2013). Available at: http://iussp.org/sites/default/files/event_call_for_papers/Abstract%20prevR.pdf

Lock, G. (2000) – Beyond the map – Archaeology and spatial technologies. IOS Press.

Lock, G.; Stancic, Z. (1995) – Archaeology and Geographical Information Systems: a European perspective. London: Taylor and Francis.

Moscati, P. (1998) – GIS applications in Italian Archaeology. Archeologia e Calcolatori. IX, p. 191-236.

Oosterbeek, L. (1993) – Gruta dos Ossos (Tomar) Um ossuário do Neolítico Final. Boletim Cultural de Tomar. 18, p. 11-28.

Oosterbeek, L. (1994) – Echoes from the East: the western network. An insight to unequal and combined development, 7000-2000 BC. PhD Dissertation. London: University College.

Oosterbeek, L. (2003) – Megaliths in Portugal: the western network revisited. In Burenhult, G., ed. – Stones and Bones. Formal disposal of the dead in Atlantic Europe during the Mesolithic-Neolithic interface 6000-3000 b.C. British Archaeological Reports – International Series. Oxford. 1201, p. 27-37.

Sayer, D.; Wienhold, M. (2013) – A GIS-investigation of four Early Anglo-Saxon cemeteries: Ripley's K-function analysis of spatial groupings amongst graves. Social Science Computer Review. 31:1, p. 71-89.

Silva, A.M. (2002) – Antropologia funerária e paleobiologia das populações portuguesas (litorais) do Neolítico final/Calcolítico. Dissertação para a obtenção do grau de Doutor em Antropologia. Coimbra: Departamento de Antropologia da Universidade (policopiado).

Silva, A.M. (2003) – Portuguese populations of Late Neolithic and Chalcolithic periods exhumed from collective burials: an overview. Anthropologie. XLI, 1/2, p. 55-64.

Silva, A.M.; Crubézy, E.; Cunha, E. (2009) – Bone weight: New reference values based on a Modern Portuguese identified skeletal collection. International Journal of Osteoarchaeology. 19:5, p. 628-641.

Silverman, B. (1986) – Density estimation for statistics and data analysis. Monographs on Statistics and Applied Probability. London: Chapman and Hall.

Tomé, T. (2006) – Reflexos da Vida na Morte: Paleobiologia das populações do Neolítico Final/ Calcolítico do Vale do Nabão – Gruta dos Ossos. Unpublished Master Thesis. Universidade de Trás-os-Montes e Alto Douro: Vila Real.

Tomé, T. (2011) – Até que a Morte nos Reúna: Transição para o Agro-pastoralismo na Bacia do Tejo e Sudoeste Peninsular. Unpublished PhD Thesis. Universidade de Trás-os-Montes e Alto Douro: Vila Real.

Tomé, T.; Oosterbeek, L. (2011) – One Region, Two Systems? A Paleobiological Reading of Cultural Continuity over the Agro-Pastoralist Transition in the North Ribatejo. In Bueno Ramirez, P.; Cerrillo Cuenca, E.; Gonzalez Cordero, A. (eds.), From the Origins: The Prehistory of the Inner Tagus Region. Oxford: Archaeopress, BAR IS, pp. 43-54.

Tomé, T.; Silva, A.M. (2013) – Práticas Funerárias na Pré-História Recente do Alto Ribatejo: Ponto da Situação. In Cruz, A.R.; Graça, A.; Oosterbeek, L. e Rosina, P. (eds.), 1º Congresso de Arqueologia do Alto Ribatejo – Homenagem a José da Silva Gomes. Arkeos, vol. 34. Tomar: CEIPHAR, p. 99-107.

Wheatley, D.; Gillings, M. (2002) – Spatial Technology and Archaeology – The Archaeological Applications of GIS. London: Taylor & Francis.