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The seeds of commerce: A network analysis-based approach to the Romano-British transport system

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ABSTRACT

Communication routes are an important subject in the study of the human past. They allowed interactions between communities and the dispersal of goods and ideas. Their study, therefore, can shed light on the way in which communities inhabited the landscape, related to each other and were affected by macro-regional trends. Many methods, such as archaeomorphological analysis and Least Cost Route modelling (LCR), have been devised and are routinely employed for the reconstruction of ancient routes. Their analysis in terms of communication, trade or historical significance, however, has usually been left unexplored. This is probably due to the connected nature of routes, which form communication networks: these are shaped by interconnected nodes and extend over territories surpassing the regional scale in such a way that even a change in a single node or link can affect the whole network. Consequently, the partial reconstruction of communication networks provided by the aforementioned methods does not usually allow a holistic analysis. In this paper the relatively well understood British Roman road network is employed to explore the analytical possibilities offered by a combination of Social Network Analysis, Spatial Network Analysis and spatial interpolation-based distribution analysis. The British road network has been reconstructed using published data but also a variation of LCR in which cost surfaces are derived from cultural data obtained from large-scale cultural inventories. The distribution of introduced food plants during the Roman period serve as an excellent proxy for the study of trade along the network and its historical consequences. This multi-period archaeobotanical dataset has some evident advantages to other types of material remains: archaeobotanical remains are not reused as, for example, amphorae and, accordingly, they reflect a distribution pattern based on consumption or commerce. Some of them are imported (as they cannot be produced locally) and, consequently, their distribution would be applied through usage of the main routes.

The results suggest a continuous inflow of exotics but highlight their changing transport routes, their differential access and the particular weight of certain nodal sites in the development of this commerce with direct impact on urbanisation and the overall economy of Britannia. The Roman road network acted as a major factor in the distribution of sites, their political and economic importance and their permanence or disappearance as global economic trends changed over time.

1. Introduction

Communication routes are an important subject in the study of the human past. They allowed interactions between communities and the dispersal of goods and ideas. Their study, therefore, can shed light on the way in which societies inhabited the landscape, related to each other, and were influenced by macro-regional connections.

The road network of Roman Britain is particularly well understood in comparison to that of other Roman provinces. This is due to the long tradition of antiquarian interest in Roman roads and the work of several people and institutions. These include the seminal works of T. Codrington (1918) and I. Margary (1973), the mapping conducted by the Ordnance Survey, the efforts of institutions such as English Heritage (now Historic England, HE), and the continuing work of British archaeologists aided by the physical particularities

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of the British landscape, which allows for the detection of roads in aerial photographs in the form of crop, soil or shadow marks. These efforts have resulted in a wealth of evidence that has permitted an, although still partial, significant reconstruction of the Roman road network. Despite depiction of the Roman road system in multiple studies, the transport network itself has rarely been actively employed to address historical or archaeological questions.

This paper aims to remedy this by proposing first an integrated methodology for a more complete reconstruction of the Romano-British transport system. This is then examined using network analyses in conjunction with data on the distribution of exotic food plants to trace their commerce. Exotic food plants are defined here as those that were either only imported or their cultivation could have become established during the Roman period and these two categories are treated and analysed independently in this study. Systematic collection of plant remains in excavations all over Britain has led to a significant body of such data for the Roman period (Van der Veen et al. 2007), which can now provide primary evidence for the investigation of the exotics' distribution that contributed to the emergence of new foodways (e.g. Van der Veen et al. 2008; Livarda and Van der Veen, 2008; Livarda, 2011).

A combination of density interpolation surfaces and social and spatial network analyses to investigate the trade and distribution of exotics has been already employed for Roman London (Livarda and Orengo, 2015), which was then contextualised within the broader commerce of exotics in Britannia. This study demonstrated the need to treat London as a node of the greater British transport network and, as a consequence, a preliminary small-scale version of the network analysis was devised. The pattern identified within London appeared to largely reflect the changes in the overall commerce network of exotics in Britannia. With the present paper we aim to provide a general analysis of this network, which will allow the research community to use it in broader studies of Roman trade and in the investigation of the degree of connectivity and integration into the commerce network of particular nodes (i.e. sites). Such analysis can then contribute to explanations of changes in regards to site function and/or activity through time.

2. Methodology: networking Roman Britain

Methods, such as archaeomorphology (Palet and Orengo, 2011) and Least Cost Route modelling (LCR) (Fiz and Orengo, 2008), have been devised and are routinely employed for the accurate reconstruction of Roman routes. Their analysis in terms of communication, trade or historical significance, however, has generally been left unexplored. This is probably due to the connected nature of routes, which form communication networks. These are shaped by interconnected nodes that usually correspond to habitation nuclei, and extend over territories surpassing the regional scale in such a way that even a change in a single node or link can affect the whole network. Knappett et al. (2011) have demonstrated how the disappearance of Akrotiri in the Minoan communication network had important consequences for the whole of the Minoan culture. In the same way, Mol (2014: 193–4) showed how a small island community can be affected and in turn affect itself wider islands' networks in the 14th century North-eastern Caribbean. Such studies serve to illustrate the importance of a holistic approach in network studies. Consequently, the partial reconstruction of communication networks provided by the aforementioned methods does not usually allow holistic analyses. In regards to this study, since a site's relative importance in terms of access to exotics depends on its position within the exotics' distribution network, only considering the whole network, its access to exotics can be understood. In this section a new set of methodologies for the reconstruction and analysis of the Romano-British transport network as a whole are described and their significance outlined. Britannia is a particularly adequate study area for this type of studies not just for the completeness of its transport system, but also because as an island it has a relatively closed network.

2.1. Filling up the gaps

The first methodological need was the reconstruction of the Romano-British road network in a suitable form for network analysis (Fig. 1). Extensive data on Roman roads are currently available and were provided by HE, the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) and the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) (the data are available upon contacting the corresponding authorities). A number of published data were also taken into account (e.g. Bishop, 2014; Codrington, 1918; Maggs, 1987; Margary, 1973; Sherman and Evans, 2004; Viatores, 1964). All this wealth of evidence, however, still did not provide a suitable network since data on many roads are interrupted and discontinuous. The completeness of the network is an influential factor in network analysis and, therefore, a methodology had to be developed to fill in the gaps (Fig. 1). LCR was employed to reconstruct the best possible route between two points by generating cost surfaces: maps representing the cost of movement. These usually employ topographic and other environmental variables like movement constrains. Because of the particularities of the British overall soft topography and the data on British Roman road stretches, which often displayed a remarkable straight course for miles (Poulter, 2014), it was decided that the sole use of topographic data was not adequate. Given the remarkable correlation between Roman roads and the distribution of cultural elements, such as sites or finds (Orengo and Palet, 2010), data from different repositories, including HE, RCAHMS, the Early Medieval Corpus of Coin Finds (EMC) and the Portable Antiquities Scheme (PAS) (the data are available upon request to the relevant authorities), were plotted on GIS and employed to generate a cost surface for LCR analysis. The data were classified according to typology (settlements or sites where given more weight than, for example, finds) and spatial accuracy. All these elements acted as attractors according to their specific weight and, therefore, the route delineated the best possible way to explain the distribution of cultural elements of Roman origin between two known stretches of a Roman road. Once the gaps in the Roman road system were filled in and the navigable river network of Britain (data modified from those published by Ellis Jones, 2012) was joined in, the transport system was transformed into a network fit for GIS-based analysis. This was achieved by correcting the network topology, repairing split, isolated or duplicate links, adding directionality to the links and creating junction information at every link crossing. No assumptions as to which routes were used were made but instead the entire navigable river transport network and all the available land transport system were included. This allowed interrogation of the network with the aim to identify which of these routes were actually in use for the movement of exotics.

2.2. Distributing exotics

The distribution of introduced food plants during the Roman period serves as an excellent proxy for the study of commerce along the network. The exotics' dataset has some advantages to other types of material: archaeobotanical remains are not reused as, for instance, pottery or metal and, accordingly, they reflect a dispersal pattern based on consumption and/or distribution. Information on the presence of exotic food plants were retrieved from a bank of 669 archaeobotanical reports collected through bibliographical